THE CULTIVATOR:

A MONTHLY PUBLICATION, DEVOTED TO AGRICULTURE.

I KNOW OF NO PURSUIT IN WHICH MORE REAL AND IMPORTANT SERVICES CAN BE RENDERED TO ANY COUNTRY, THAN BY IMPROVING ITS AGRICULTURE.—*Wash.*

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THE CULTIVATOR.

TO IMPROVE THE SOIL AND THE MIND.

On the Utility of Agricultural Schools.

We lay down, and intend to illustrate, the following propositions:

I. That science has become important, if not essential, to the successful prosecution of the arts of labor;

II. That a knowledge of many of its principles is particularly necessary for the improvement of agriculture;

III. That theory and practice—science and art—when made companions, reciprocally aid and improve each other; and hence,

IV. That the best way of promoting useful improvement in both, is to blend them together in schools of instruction—to teach the science and the art simultaneously, to those who are destined to manage the productive labors of our country.

Our object in introducing these propositions to the notice of the reader, is to turn the public attention to the importance of wedding science to art—of teaching both simultaneously,—in agriculture and the mechanic arts; and of enlisting the feelings, and inviting the aid, of our patriotic citizens, which we would fain hope might embrace no inconsiderable number of our statesmen, to the establishment of schools of scientific and practical agriculture.

In the discussion of the subject, we shall avail ourselves of the opinions of some of the most eminent men of the age. Although most of the quotations we shall make, may have a special reference to the mechanic and manufacturing arts, they apply with equal force to the art of agriculture.

It is self-evident, that if an individual—be he a manufacturer, a mechanic or a farmer—can, in consequence of new modes of applying and economizing labor, afford to sell his goods or his farm products, for a third less price than his neighbor—it is self-evident, we say, that such an individual possesses a decided advantage—that he will command the market—will grow rich, while his neighbor must grow poor—and that the disparity in the condition of the two, under like prudent management, will go on progressively increasing. It is precisely with communities and nations as it is with individuals. The country which produces the cheapest and best manufactured goods, or the best and cheapest agricultural productions, will ever possess a decided advantage in the market of nations—will monopolize the profits of commerce, and become opulent and powerful—while her rivals will sink as she rises, and become poor and dispirited. So true is it, that the prosperity of a country depends essentially on the extent and economical management of its productive labor. The productive labor of our country is performed principally by the agricultural, mechanic and manufacturing classes.—Hence, whatever tends to increase the amount of our domestic productions, or to cheapen their cost, has a direct tendency to benefit all classes—to increase the aggregate wealth of the state, and to multiply the comforts and enjoyments of its inhabitants.

This brings us to the consideration of our first proposition, *that science has become important, if not essential, to the successful prosecution of the arts of labor.*

But first let us inquire, *what is science?* Sir J. J. F. Herschel says,—"Science is the knowledge of many, orderly and methodically digested and arranged, so as to become attainable by one. The knowledge of reasons and conclusions constitute *abstract*, that of causes and their effects, and of the laws of nature, *natural science*."* It is to the latter of these branches of science that our remarks will principally refer.

Half a century has produced a wonderful revolution in most of the arts of labor. Old and tedious processes have been superseded by the application of science, and by inventions which the rays of science have enkindled into being. The elements—fire, water and air, have been brought more under human control, rendered more subservient to human wants, and are applied, to a prodigious extent, as substitutes for human labor. Science itself has advanced in improvement and usefulness, with accelerated speed; and the processes of the manufacturer and artisan are now almost wholly regulated by its laws; and it is progressing in new discoveries with rapid pace. "Indeed, such is the quickening power of science, that it is scarcely possible, that its simplest germ should be planted in the human mind, without expanding into a healthy growth. It generates, as it moves on, new thoughts, and new inquiries, and is forever gathering without exhaustion, and without satiety. The curiosity which is once awakened by it, never sleeps; the genius, which is once enkindled at its altar, burns on with unextinguishable flame."† The consequence of this accelerated progress in scientific knowledge, and its more general application to the arts of labor, has been, that our manufacturing operations have been simplified, their labor abridged, and their products improved and cheapened. And wherever the principles of science have been applied to agriculture, the change has been equally great and salutary. But agriculture, from its modest pretensions, its humble condition, and, we are sorry to add, from a limited knowledge and rooted prejudice, in most of those who conduct its details, has been the last to profit, and has profited the least, from the general discoveries and improvements of the age. Practical farmers are seldom men of scientific knowledge, and scientific men seldom descend to the drudgery of practical agriculture. In the work shops, science and art have long been companions, and have mutually profited by each other's counsel and aid. When they shall combine their labors in the field, not only will agriculture double her products, but useful knowledge will be diffused, prejudice will be eradicated, and the husbandman will rise, in the scale of society, to that independent position which our constitution and laws have assigned to him, and which the perpetuity of our political institutions require he should occupy.

Our second proposition is, *that scientific knowledge is particularly essential to the improvement of agriculture.*

The sciences which have been principally instrumental in improving the manufacturing and mechanic arts, are chemistry, and those which relate to mechanical philosophy. A knowledge of these is equally important in the business of agriculture. Chemical knowledge is essential to a correct ascertainment of the properties of soils—of lime, marl and other fertilizing matters—a knowledge of which would often save useless expenditure, and ensure certainty of results. It is also beneficial in conducting economically a great many operations on the farm, and in the kitchen. Even

"The farm-servant," says Lord Brougham, "or day-laborer, whether in his master's employ, or tending the concerns of his own cottage, must derive great practical benefit,—must be both a better servant, and a more thrifty, and therefore a more comfortable cottager, for knowing something of the nature of soils and manures, which chemistry teaches, and something of the habits of animals, and the qualities and growth of plants, which he learns from natural history and chemistry together. In truth, though a man be neither machanic nor peasant, but only one having a pot to boil, he is sure to learn from science lessons which will enable him to cook his morsel better, save his fuel, and both vary his dish and improve it. The art of good and cheap cookery is deeply connected with the principles of chemical philosophy, and has received much, and will yet receive more, improvement from their application. Nor is it enough to say, that philosophers may discover all that is wanted, and may invent practical methods, which it is sufficient for the working man to learn by rote, without knowing the principles. He never will work so well if he is ignorant of the principles; and for a plain reason:—if he only learns his lesson by rote, the least change of circumstances puts him out. Be the method ever so general, cases will always arise in which it must be varied in order to apply; and if the workman only knows the rule, without knowing the reason, he must be at fault the moment he is required to make any new application of it. This, then, is the first use of learning the principles of science: it makes them more skilful, expert and useful in the particular kinds of work by which they are to earn their bread, and by which they are to make it go far and taste well when earned."*

A knowledge of the principles of mechanics is also important to the farmer, to enable him to judge of the relative value of farm implements, to detect their faults, and to correct them. But the business of the farm embraces a wider scope—it embraces the whole range of natural science—the earth, the air, the water, and the various tribes of domestic animals and cultivated plants come within its purview.

"The Creator of the universe," says Gov. Everett, "has furnished us the material [for useful scientific investigation]; it is all around us, above and beneath us; in the ground under our feet; the air we breathe; the water of the ocean and the fountains of the earth; in the various subjects of the kingdoms of nature. We cannot open our eyes, nor stretch out our hands, nor take a step, but we see, and handle, and tread upon the things, from which the most wonderful and useful discoveries and inventions have been deduced. What is gun-powder, which has changed the character of modern warfare? It is the mechanical mixture of some of the most common and least costly substances. What is the art of printing? A contrivance less curious as a piece of mechanism, than a musical box. What is the steam engine? An apparatus for applying the vapor of boiling water. What is vaccination? A trifling ail, capable of protecting human life against one of the most dreadful maladies to which it is exposed.

"And are the properties of matter all discovered? its laws all found out? the uses to which they may be applied all detected? I cannot believe it. We cannot doubt, that truths now unknown are in reserve, to reward the patience and the labors of future lovers of truth, which will go as far beyond the brilliant discoveries of the last generation, as those do beyond all that was known to the ancient world. The pages are infinite in that great volume, which was written by the hand divine, and they are to be gradually turned, perused, and announced, to benefitted and grateful generations, by genius and patience; and especially by patience; by untiring, enthusiastic, self-devoting patience. The progress which has been made in art and science is indeed vast. We are ready to think a pause must follow; that the goal must be at hand. But there is no goal; and there can be no pause; for art and science are in themselves progressive. They are moving powers, animated principles: they are instinct with life; they are themselves the intellectual life of man. Nothing can arrest them, which does not plunge the entire order of society into barbarism. There is no end to truth, no bound to its discovery and application; and a man might as well think to build a tower, from the top of which he could grasp Sirius in his hand, as prescribe a limit to discovery and invention.

"Never do we more evince our arrogance, than when we boast of our knowledge. True science is modest; for the keen, sagacious eye discerns that there are deep, undeveloped mysteries where the vain sciolist sees all plain. We call this an age of improvement, as it is. But the Italians in the age of Leo, and with great reason, said the same of their age; the Romans, in the time of Cicero, the same of theirs; the Greeks, in the time of Pericles, the same of theirs; and the Assyrians and Egyptians, in the flourishing periods of their ancient monarchies, the same of theirs. In passing from one of these periods to another, prodigious strides are often made; and the vanity of the present age is apt to flatter itself, that it has climbed to the very summit of invention and skill. A wiser posterity at length finds out, that the discovery of one truth, the investigation of one law of nature, the contrivance of one machine, the perfection of one art, instead of narrowing, has widened the field of knowledge still to be acquired, and given, to those who come after, an ampler space, more numerous data, better instruments, a higher point of observation, and the encouragement of living and acting in a more intelligent age. It is not a century since the number of fixed stars was estimated at about three thousand. Newton had counted no more. When Dr. Herschel had completed his great telescope, and turned it to the heavens, he calculated that two hundred and fifty thousand stars passed through its field in a quarter of an hour!"†

"It is a curious fact, that objects, at once the most familiar and most useful, are apt to be the last on which we

* Nature and advantages of the study of the physical sciences.

† Judge Story's discourse before the Mechanics' Institute of Boston.

* Library of Useful Knowledge.

† Importance to practical men of scientific knowedge.

bestow careful investigation and reflection. The great elements of physical nature, earth, air, heat and water, the very instruments by which we live, move, and have our being—how seldom do even these excite more than a passing notice. We till the soil, indeed, for it is the fertile parent of our daily bread; yet we rarely look beyond the surface to unfold the mysteries that lie beneath. The air is inhaled at every breath, yet we care not whither it cometh, or whither it goeth. The principle of heat is the supporter of animal and vegetable life throughout the universe; yet, though it greets us each morning with the rising sun, and calls upon us from every shining hill-top for admiration, how rarely do we think of it but as a mere matter of course. And water—how wonderful, how beautiful, how useful, how seldom do we regard it but as the vulgar instrument of daily comfort or daily necessity!

"All this is susceptible of easy explanation. Familiarity breeds contempt in more ways than one. Whatever is new and rare excites curiosity and invites attention; while, on the other hand, commonness begets indifference. We are apt to imagine that *whatever is familiar is thoroughly understood;* while things which are new are fancied to possess properties which do not appear upon the surface. A drop of water is not less beautiful or less wonderful than a diamond, yet who stops to ponder over the one, or fails to pause and gaze with admiration on the other? Thus it is that the useful, the beautiful, the truly wonderful, are neglected, because they are common, while we eagerly run after more glittering toys, because they are rare."—*Fireside Education.*

How well do these remarks apply to the very *common* business of agriculture! It is too common a concern to arrest the attention of those who are not immediately interested in its labors; and even the practical farmer, we are sorry to add, too often *presumes* he understands it thoroughly, merely on the ground, that he has long been familiar with its details. And yet it is the great business of our country—the basis of its independence and wealth, and the main safeguard of its freedom. It is a business susceptible of being vastly improved by modern science; and yet we have no public means of extending to it this important aid. We have schools in abundance—we believe we may with propriety say in excess—for it is rather by their quality than their number that we should judge of their usefulness—to teach the higher branches of learning to the few—to the non-producing classes,—tending to create artificial distinctions, where none should obtain but such as are rewards to merit—and these schools have been established and maintained by a public expenditure of three millions of dollars in this state.

"The light of heaven is not more the right of all," says a late writer, "than the light of knowledge; and a scheme to appropriate to a privileged class of persons the glorious rays of the sun, while all beside are to be wrapped in the chill shadows of night, would not be more a conspiracy against the natural rights of man, than is any system which would shut out from the view of the people at large, the intellectual light implanted by education."

Now we insist, that with the advantages of learning that have been extended to the comparatively small unproductive classes, coupled with the practical instruction which would be obtained in agricultural schools, our agriculture would in a few years be made to double its products, agricultural labor would be more honored and more inviting, and a corresponding improvement would be witnessed in the intellectual and moral condition of society. Although a *common* employment, it is an *indispensable* one; and although mere animal power may *perform*, it requires mind—science—to *direct* its operations, with usefulness and profit.

"Within a few years," says the author last quoted, "society seems to have received a new impulse, and the conviction, that not only the happiness of private life, but the security of our institutions, depends upon the diffusion of knowledge, seems to pervade all classes. Nay, the opinion has gone abroad, that education is the only lever which can lift a community from the degradation to which the tendencies of human nature would drag mankind. If you would correct a prevalent vice, if you would purify the fountains of society, it is admitted that you must begin with the young. It is difficult to change the character of those who have reached mature age, and become the subject of established habits. The oak which has struck its roots deep and strong into the soil, and whose branches are hardened by time, cannot easily be bent to new forms. It is the sapling alone that submits to be trained at the will of the cultivator."

Wherever science has been applied to agriculture, and blended with the labors of the field, it has proved of great advantage. To illustrate its utility, Lavoisier, the great French chemist, undertook the management of a farm, and in four years he doubled its products, and more than doubled its profits, by the aids which science contributed to its culture. Von Thaer, who is at the head of the great agricultural school of Prussia, has produced, it is believed, still more favorable results. The students of the Hoffwyl agricultural school of Fellenburgh, obtain great salaries all over Germany, as managers of farms and landed estates. So manifest have become the advantages of science to the improvement of agriculture, that schools of practical and scientific instruction have been established in the German states, in France, Russia and in Ireland. Indeed, small as is the smattering of agricultural science among our farmers, we are daily profiting by it; and individual farms and districts evince a superiority of culture, in proportion as its principles are recognized and judiciously applied.

Our third proposition is, *that theory and practice—science and art—when acting in concert, reciprocally aid and improve each other.*

"It was not until some fortunate discoveries in the arts had led to opulence," says Judge Story, "that scientific men began to surrender their pride, and to devote themselves practically to the improvement of the arts. The first great step in modern science was to enter the work-shop, and superintend its operations, and analyze and explain its principles, and the benefits derived from this connexion have already been incalculable both to art and science. Each has been astonishingly improved by the other; and a hint derived from one has often led to a train of inventions and discoveries, the future results of which are beyond all human power to measure. Thus, dignity and importance have been added to both. The manufacturer, the machinist, the engineer, the chemist, who is eminent in his art, may now place himself by the side of the scholar, the mathematician and the philosopher, and find no churlish claim for precedency put in. His rank in society, with reference either to the value of the products of his skill, or the depth of his genius, sinks him not behind the foremost of those, who strive for the first literary distinction. This fortunate change in the public opinion, which has made it not only profitable, but honorable, to pursue the mechanical arts, is already working deeply into all the elements of modern society."

"It may now be said with truth, that, in a general view, science precedes art; that is, the improvements which are made in art, arise more often from an exact investigation of principles, than from bare experiments and accidental combinations. Principles suggest the experiment, rather than experiment the principles. In the most important branches of manufactures, where skill is constantly in demand, and economy in operation is so indispensable, and competition is universal, there is now a perpetual tasking of the wit of man to invent some cheaper, thriftier, or neater combination. Something to increase the velocity, and uniformity of motion, the delicacy and certainty of spinning, the beauty or fineness of fabrics, the simplicity or directness in application of power, or something to ascertain or separate the worthless from the valuable in materials, is the ambition of a thousand minds at the same instant; and the project holds out ample rewards to the fortunate discoverer."

"It is so obvious that he who is engaged in the practice of an art, must, with equal advantages, be far better qualified to improve and perfect its operation, than he who merely theorizes without any knowledge of practical difficulties, that it is matter of surprise, that it should have been so long overlooked."

"I might remark, that genius and talent are limited to no rank or condition of life. They have been distributed by the bounty of Providence, with an equal hand, through every class of society. They are among those gifts, which poverty cannot destroy, or wealth confer; which spring up in the midst of discouragements and difficulties, and, like the power of steam, acquire new elasticity by pressure; which ripen in the silence of solitude, as well as in the crowded walks of society; which the cottage may nourish into a more healthy strength, than even the palace or the throne. The most formidable enemy to genius is not labor, but indolence; want of interest and excitement; want of motive to warm, and of object to accomplish; ignorance of means leading to indifference of ends. Hence it is, that the very highest and very lowest orders of society, often present the same phenomena—a fixed and languishing disease of the intellectual powers, where curiosity wastes itself in trifles, and a cold listlessness, brooding over the thoughts, lets fall a preternatural stupor. Their misfortune is that so beautifully touched by the poet—

> "But knowledge to their eyes her ample page,
> "Rich with the spoils of time, did ne'er unroll,"

"I might remark, in the next place, that the rewards of science are most ample, whether they be viewed in reference to personal enjoyment, to rank in society, or to substantial wealth."

"It is from considerations of this nature;—that what has been, must continue to be; that art is never perfect, and nature inexhaustible; that science, while it is the master of art, is itself ultimately dependent upon it; that the intellectual power grows up in all stations, and in all soils; that, all other circumstances equal, he who knows and practises, must forever take the lead of him who merely knows, and has none of the skill to apply power, or the practical sagacity to overcome difficulties; that he, whose interests are indissolubly connected with his science, and who feels at every turn the animating impulse of reward, as well as the pleasure of speculation, and the desire of fame, has more enduring and instant motives for exertion, than he who merely indulges his leisure, or his curiosity;—it is, I say, from these considerations, that when the artizan and the mechanic [and the farmer] shall have become instructed in science, the inventions of this class will have become more numerous, more useful, more profitable, than those of any other class, and even perhaps of all other classes of society.

"What an animating prospect does this afford! What noble ends to poor, neglected suffering genius! What constant comfort to cheer the hard hours of labor, and the heavier hours of despondency! Much less of success in life is really dependent upon accident, or what is called luck, than is commonly supposed. Far more depends upon the objects which a man proposes to himself; what attainments he aspires to; what is the circle which bounds his visions and his thoughts; what he chooses, not *to be educated for*, but *to educate himself for;* whether he looks to the end and aim of the whole life, or only to the present day or hour; whether he listens to the voice of indolence or vulgar pleasure, or to the stirring voice of his own soul, urging his ambition on to the highest objects. If his views are low and grovelling; if the work-shop [or farm], in its cold routine of duties, bounds all his wishes and his hopes, his destiny is already fixed; and the history of his whole life may be read, though the blush of youth still linger in his cheeks. It is not a tale merely twice told; it has been told for millions. If, on the other hand, he aspires to be a man, in dignity, independence, spirit and character, and to give his talents their full scope and vigor; if, to a steady elevation to the practice of his art, he adds a scientific study of its processes and principles, his success is as sure as any thing on this side of the grave can be."*

"The distinct purpose [of the Boston Mechanic Association] is," says Mr. Webster, "to connect science, more and more, with art; to teach the established, and invent new, modes of combining skill with strength; to bring the power of the human understanding in aid of the physical power of the human frame; to facilitate the co-operation of the mind with the hand; to augment convenience, lighten labor and mitigate toil, by stretching the dominion of mind, farther and farther, over the elements of nature, and by making those elements, themselves, submit to human rule, follow human bidding, and work together for human happiness."†

We have endeavored to show, that science is essential to the successful prosecution of the arts, in order to sustain our rank in the rivalship of nations, to maintain our commercial advantages, and to ensure our progress in enterprise, wealth and the other elements of national prosperity;—that science is particularly necessary to our improvement in agriculture, the great business of our country, the stay of its commerce, the principal source of its wealth, the bond of its union, and the security of its freedom; and that science and art—theory and practice—when combined, reciprocally aid and improve each other. This brings us to our fourth and last proposition, viz.

That the best way to promote useful improvement in science and art—the great instruments of wealth and power,—is to teach both, simultaneously, to those who are destined to manage the productive labors of our country.

We shall confine our remarks, on this branch of the subject, to the arts of agriculture and agricultural mechanics.

That a knowledge of the leading principles of natural science, is essential to agriculture, in its most improved and profitable management, is evidenced in the established utility of schools of scientific and practical instruction, in European countries, and in their continual multiplication; and in the improvements which science has effected in our own agriculture, wherever its principles have been coupled with intelligent practice. This fact being conceded, the question presents, how are our young farmers to acquire the requisite knowledge? our common schools do not teach it; nor does the farm afford the requisite means of instruction. And as for our colleges and academies—

"Generally speaking," says Gov. Everett, "even now, all actual instruction in the principles of natural science is confined to the colleges; and the colleges are, for the most part, frequented only by those intended for professional life; but it does not seem a proper arrangement, that none but those intended for the pulpit, the bar, or the profession of medicine, should receive instruction in those principles, which regulate the operation of mechanical powers, and lie at the foundation of complicated machinery; which relate to the navigation of the seas, the smelting and refining of metals, THE COMPOSITION AND IMPROVEMENT OF SOILS, the reduction to a uniform whiteness of the vegetable fibre, the mixture and application of colours, the motion and pressure of fluids in large masses, the nature of light and heat, the laws of magnetism, electricity and galvanism. It would seem that this kind of knowledge was more immediately requisite for those who are to *construct and make use of labor saving machinery*, who are to navigate the ocean, to lay out and direct the excavation of canals, to build steam engines and hydraulic presses, and to conduct large *agricultural* and manufacturing establishments. Hitherto, with some partial exceptions, *little has been done to afford to those engaged in these pursuits that*

* Discourse before the Boston Mechanic Institution.

† Introductory lecture, before the Boston Mechanic Institution, by Hon. Daniel Webster.

knowledge, which, however convenient to others, would seem ESSENTIAL to them. There has been scarce anything which could be called education for practical life; and those persons who, in the pursuit of any of the useful arts, have signalized themselves by the application of scientific principles for the invention of new processes, or the improvement of the old, have been self-educated men."

"Neither is it intended, that the education which we recommend, should extend to a minute acquaintance with the practical applications of science to the details of every art. This would be impossible, and does not belong to preparatory education. We wish only that the general laws and principles should be so taught, as greatly to multiply the number of persons competent to carry forward such casual suggestions of improvement as may present themselves, and to bring their art to that state of increasing excellence, which all arts reach, by long-continued intelligent cultivation."*

Our young men, destined to agricultural pursuits, do not, cannot, get scientific instruction in the college; for the collegiate period of life is that in which they must acquire a practical knowledge of their business. It is only, therefore, by combining labor with study, that they can expect to profit largely by the advantages which science proffers. And in schools of this kind, not only the elementary principles of science may be learnt, but the application of these principles may be tested and illustrated in practice—and, what is of no little moment, the best practices in the art, in all its diversified branches, may be taught at the same time. Instead of seriously interfering with each other, study and labor, we have seen, being directed to a common object of usefulness, tend to enlighten, encourage and animate each other.

Children belong to the republic; that is, the public have a deep interest in the manner of their being brought up and educated—whether to habits of industry and usefulness, or those of indolence and vice. They are the materials which are to constitute the moral and political fabric of the rising generation; and every measure which has a tendency to render them intelligent and virtuous, indirectly benefits every member of the community.

"An intelligent class" remarks Gov. Everett, "can never be, as a class, vicious; never, as a class, indolent. The excited mental activity operates as a counterpoise to the stimulus of sense and appetite. The new world of ideas; the new views of the relation of things; the astonishing secrets of the physical properties and mechanical powers, disclosed to the well informed mind, present attractions, which—unless the character is deeply sunk—are sufficient to counterbalance the taste for frivolous or corrupt pleasures; and thus, in the end, a standard of character is created in the community, which, though it does not invariably save each individual, protects the virtue of the mass."

We shall close our remarks on this deeply interesting subject, with another extract from Gov. Everett's essay on the importance of scientific knowledge.

"Contemplate, at this season of the year," says he, "one of the magnificent oak trees of the forest, covered with thousands and thousands of acorns. There is not one of those acorns which does not carry within itself the germ of a perfect oak, as lofty and as wide-spreading as the parent stalk; which does not unfold the rudiments of a tree that would strike its roots in the soil, and lift its branches towards the heavens, and brave the storm of a hundred winters. It needs for this but a handful of soil, to receive the acorn as it falls, a little moisture to nourish it, and protection from violence till the root is struck. It needs but these; and these it does need, and these it must have; and for want of them, there is not one out of a thousand of those innumerable acorns, which is destined to become a tree.

"Look abroad through the cities, the towns, the villages of our beloved country, and think of what materials their population, in many parts already dense, and every where rapidly growing, is, for the most part, made up. It is not lifeless enginery, it is not animated machines, it is not brute beasts, trained to subdue the earth: it is rational, intellectual beings. There is not a mind, of the hundreds and thousands in our community, that is not capable of making large progress in useful knowledge; and no one can presume to tell or limit the number of those who are gifted with all the talent for the noblest discoveries. They have naturally all the senses and all the faculties—I do not say in as high a degree, but who shall say in no degree?—possessed by Newton, or Franklin, or Fulton. It is but a little which is wanted to awaken every one of these minds to the conscious possession, and the active exercise, of its wonderful powers. But this little, generally speaking, is indispensable. How much more wonderful an instrument is an eye than a telescope! Providence has furnished this eye; but art must contribute the telescope, or the wonders of the heavens must remain unnoticed; and it is for want of the little, that human means must add to the wonderful capacity for improvement born in man, that by far the greatest part of the intellect, innate in our race, perishes undeveloped and unknown. When an acorn falls upon an unfavorable spot, and decays there, we know the extent of the loss;—it is that of a tree, like the one from which it fell;—but when the intellect of a rational being, for want of culture, is lost to the great ends for which it was created, it is a loss which no one can measure, either for time or eternity."*

"The design of promoting the advancement of the sciences, is a far nobler object of ambition," says Lord Bacon, "than either *private* aggrandizement or *patriotism* itself. The first is vulgar and degenerate; the second, that is, the ambition of those who endeavor to raise their own country in the scale of nations, is more noble, but has not less of cupidity: but if any one should labor to restore and enlarge the power and dominion of the whole race of man over the universe of things,—this kind of ambition, if so we may call it, is without doubt more wise and dignified than the rest. Now this power of man over things is entirely founded in arts and sciences."

* Essay on the importance of scientific knowledge.

Culture and Propagation of the Morus Multicaulis.

The point seems to be settled, at least for the present, that in the states south of New-York, the multicaulis is to supersede all other descriptions of the mulberry for the fabrication of silk. And even in our northern latitude, many persist in saying, that it may be cultivated with great profit, and some have realized large sums from their plants and buds. The price here is now two and a half cents per bud. But we ought to repeat, that the only certain mode relied upon for preserving the plants through the winter, at the north, is either to take up the entire plant in autumn, and bury it in the ground, or to cut it off near the surface, bury the top and cover the stump. It is contended, that the sprouts which will annually spring from the plant, thus cut down, will afford more leaves than the tree would if left to grow, while the foliage is much more easily gathered. Besides this, a great gain is effected by obtaining the tops for propagating, as under good management almost every bud will produce a plant the coming season.

The interest has become so general in the increase of this plant, that directions for propagating it cannot fail of being acceptable to our readers; and we therefore sit down to give these directions, not however as derived from personal experience, but from the practice of two of the oldest and most eminent growers of the plant in the United States—Gideon B. Smith, of Baltimore, and T. S. Pleasants, of Goochland, Va. We extract these directions from the communications of these gentlemen, published in the Farmers' Register.

Mr. Smith directs as follows:

"The simplest and most common mode of cultivating the multicaulis is as follows:—Prepare the ground in the spring as for corn. Run furrows four or five feet apart as preparatory to planting corn. Then take the limbs and young wood that grew last year, cut off close to the tree, and lay them lengthwise, the but end of one limb a short distance, a foot or so, from the top end of the last laid down; cover the whole limb, with a hoe, about one or two inches deep; generally every bud on each limb will grow, and make a tree from three to five feet by autumn. The ground should be kept free from weeds and grass by cultivation, as in corn. About the last of July, it is best to take a sharp spade and separate the young trees, by driving it down midway between them; but this is not essential; they can be separated when taken up the spring [or autumn] following. The next spring they should be taken up and planted in regular form in the orchard, where they are permanently to remain. The best method is to plant them six or eight feet apart in the row, and the rows ten to sixteen feet apart—the rows running north and south, or north west and southeast. By this mode of cultivation it will be perceived, that eight or ten times as many multicaulis trees may be raised on an acre of ground as cornhills, and that, as the crop is ready for the market, (when they are raised to sell,) as early as the crop of corn, there is no reason for the extravagant prices demanded for them. They would be a very profitable crop at five cents a tree.

"There are other modes of cultivation which it may be well to describe here. When cuttings are scarce, and the loss of many of them is of much consideration, a hot-bed should be made in the usual way, and the cuttings started in it as follows:—Cut all the limbs and young wood into short pieces, with *one bud* on each; lay them flat on the surface of the hot-bed, in lines lengthwise, the ends of the cuttings a quarter of an inch apart, and the lines of cuttings two inches apart, with the bud uppermost. Then sift rich garden mould over them, half an inch deep, and put the glass frames on the beds. Every night and morning water them with a watering pot, merely enough to keep the earth moist.—They should be planted in the hot-bed one month before the usual disappearance of frost. In and around Baltimore, the first of April is the time, as frost usually disappears altogether about the first to the tenth of May. By the time the frost disappears, the plants will be about the size of cabbage plants, and may be taken out of the bed and planted in the orchard where they are permanently to grow. During the time they are in hot-beds, care should be taken in warm days to give them air, by raising the glass frames [sashes]; and if severe frosts occur, to cover the glass with straw or matting; and when they are set out in the field they should be well watered, for a few days, in the evening. The practice of propagating as above, from single buds, was first adopted by me, and followed for many years with very great advantage."

* Essay on the importance of scientific knowledge.

"Another method is by layers. Instead of cutting off the limbs and tops, bend the whole tree down to the ground, and cover it, limbs and all, two or three inches deep, with good mould—it would be well to turn up the ends of the limbs, so that the points are just above the ground. All the buds that are on the whole tree under ground, will generally grow, and each one make a tree by autumn, when they are to be taken up and separated. The objection to this plan is, that the young trees are apt to be too crowded, and consequently do not grow as large as when the limbs and young wood are cut off, as in the first mode; and I do not find that it is any more certain, or possesses any one advantage, over that mode. All other modes of propagating, as grafting, &c. are perfectly useless, and therefore nothing need be said about them."

The following is from letters of Mr. Pleasants to Mr. Ruffin, editor of the Farmers' Register:—

"On the subject of *one bud cuttings* of multicaulis, I can give thee my experience this year, which perhaps may be of some value. It is probably known to thee, that with scarcely any exceptions, there was a great failure in getting cuttings to start last spring. John Carter is the only cultivator I know who has succeeded well. Next to him, I place myself—but at a considerable distance in the rear. To the north, not more than one in fifteen or twenty grew. The failure was owing to a most peculiar season, for I never saw cuttings start better than mine did. An excessive drought, at the time the plants began to root, dried them up. In preparing my cuttings, out of some of the strongest and best wood, I cut 10,000 or 15,000 with one bud. The remainder had two buds. The one bud cuttings I planted to themselves, in the same sort of ground with the others, and they were all subsequently treated alike. Taking the piece at large, they stand as well as the best spot of two bud cuttings, and much better than the greater part of them. They came up with great regularity, and have come off very evenly.

"If the season is propitious, there is no reason why a cutting with one bud should not grow as well as one with two buds. A large one may be stuck deeper in the ground, and in a drought, it may be longer under the influence of moisture. But with *early planting*, I have no hesitation in relying upon my good one bud cutting; and early planting, by the way, is more or less important to the success of every mode. I have never taken up my multicaulis so early in the spring, but what I found the buds started, and the little rootlets in the act of being thrown out. The growth must, therefore, be checked by exposure to the air and transplanting.—From my observations, the conditions I would recommend (and which I rely on so fully that I intend to practise them,) in order to insure success to one-buds, are as follows: Preserve the plants during winter in a cool place, not exposed to the sun. Let the ground be prepared, so that the planting be may commenced as early as the season will permit; if in February the better, and at all events early in March, [in Virginia.] The soil should not be so light or sandy as to become thirsty very soon. Let the cuttings be prepared by separating midway between the joints, and stick them deep enough for the bud to be covered from an inch to an inch and a half, according to the texture of the soil. The bottom of the slip will then be about two and a half inches beneath the surface, a depth to which the ground seldom becomes entirely dry in the early part of the spring—and if there be any choice of ground in the lot, select for single buds that part which lies the lowest. With these precautions, and, above all, *early* planting, no failure can, in my opinion, ensue. By a strong cutting, I mean one taken from the larger part of the main stem, of a vigorous stem, and those near the base of thrifty lateral branches. Some days ago, I removed the earth from a number of my single bud plants, for the purpose of examining them carefully. I found some smaller than I intended to plant, but the trees were as large as those from the largest cuttings. My plants will this year yield per cutting about forty buds, on the average, perhaps more; and the most of them grow on a thin shallow soil, that never was manured. It is the opinion of many men of judgment, that the present prices will be nearly or quite sustained another year."

In cutting off the laterals, or branches, for propagation, Mr. Pleasants recommends, that the lower bud on the branch be left to produce a new branch another season. He also thinks fall planting of the buds will succeed best, and intends to try it.

The editor of the Register gives some additional facts in regard to propagation, from Mr. Sydney Weller, of N. Carolina. It is well known that the wood to the terminal points of some of the branches do not ripen early enough to render them sound and hardy, and that the cold of winter therefore destroys them. Mr. Weller cuts the branches after the occurrence of the first slight frost, and buries them. The consequence is, that the tender, half-ripened wood matures in the soil, and the buds all grow in the spring.

In propagating by buds, upon light soils, it would evidently be of service to tread the earth upon the buds, after they are covered, as we do upon garden seeds, with a view to render the ground more compact, and prevent excess of evaporation.

Another mode of propagating is, first to take up the entire plant, particularly when it has grown but

one year, and to bury it horizontally, roots and all, in the manner practised with branches. It is said, that being thus connected with the roots, the buds and plants which they produce, are not liable to be injured by drought.

The Farmers' Garden.

KITCHEN DEPARTMENT.

In the enumeration of articles to be cultivated in the garden, for consumption in the family, other than the fruits we have spoken of, we shall notice those which are of most easy culture, suitable to our climate, and of substantial use in household economy; and shall notice them in alphabetical order.

1. ASPARAGUS. This is one of the most valuable products of the garden, both on account of the little labor which it demands, and the rich and abundant returns it makes for the table, or for market: for after a bed of it is once established, it is rendered productive for many years with but little labor. The ground should be dug deep, well manured and pulverized, and laid off in beds of four feet or more, with two feet alleys between them. It is preferable to trench the ground, and to throw in manure at the bottom of the trench. Sow the seeds thinly in drills a foot asunder, and two inches deep; and when the plants are well established, thin them to eight or twelve inches asunder. If plants are to be used,—and they are to be had at the nurseries at 50 to 75 cents the hundred,—gather from four to six inches of the earth from the top of the beds, into the alleys, place the plants at twelve inches distance each way, then cover them with the dirt taken from the surface. The asparagus from seed, if the soil and management are good, may be cut the third year; from transplanted roots generally the second year. The drier the bottom of the bed, the deeper may the planting be made. The beds should be kept free from weeds, and in autumn it is advisable to cover them with coarse dung, which should be taken off in the spring, and the surface well loosened with a fork. With care an asparagus bed will last twenty years; Cobbett says three generations. We are acquainted with but one variety, and that is good enough. The seed may be sown in the spring—the plants put out then or in autumn. In our latitude asparagus is fit to cut from the 15th to the 25th April; and the cutting may be continued till the middle of June.

2. BALM, is a perennial plant, purely medicinal. There are two varieties, the high and low. A few plants of each in the border are desirable.

3. BASIL is a sweet pot-herb, and is dried for winter use. It is an annual, and the seed should be sown in very fine earth.

4. BEANS. What are with us generally termed English beans (*Vica faba*) are not much cultivated, not proving productive in our hot summers. They should be planted in April, where they will be most protected from heat, in rows four feet apart, and the plants four inches apart. Of the kidney, or common bean, there are a great many varieties, both of bush sorts and runners. The early sorts may be planted late in April or early in May, the general crop the 20th May, and even in July for pods to be preserved during winter. Of the runners, the Lima, horticultural and sieva (formerly called case knife beans) are the most esteemed. The Lima should be planted as early as the warmth of the soil will permit. Bush beans are ordinarily planted in drills, two feet apart, or in single drills upon the edges of the plats or borders. The pole beans may be planted in hills, two and a half to three feet each way. Beans not only serve a valuable purpose as food in the summer, but are useful in winter, either after they have ripened, or when gathered green, and pickled in the pod, or dried in the berry. This is particularly the case with the Lima, when shelled green and dried. Most sorts of the bean like a light, dry, but rich soil.

5. BEETS. Though not generally raised by farmers, the beet is a valuable root for the table, and for all kinds of farm stock. Their nutritive properties are indicated by the sugar they afford—their profitable culture by the great product which they yield. This is one of the good things of which there is no danger of having too much; and yet a rod of ground will supply a family. Sow the turnip rooted for early use, and the blood variety for winter. The beet is sown in drills, at least a foot apart, and the plants should be thinned to six inches. Great size is not desirable, as those of medium growth are found to be preferable for flavor and nutritive properties. Harvest the beet as soon as it has done growing, as it deteriorates, if suffered to stand longer in the ground. It is a good practice to steep the seed in tepid water, for 24 to 48 hours before it is deposited in the ground, and to press the earth upon it afterwards.

In preserving beets, and most other roots, for winter use, they should be kept from heat and too much air. After they are freed from external moisture, they should either be secured in pits, or packed, or at least covered, in the cellar with dry earth or sand.

6. BROCOLI is but little cultivated, though it is a delicious vegetable. It belongs to the cabbage family, and is managed like it. The head is boiled and eaten like the cabbage. There is a white and a red, the latter the most certain crop. It comes to maturity for eating about as soon as cabbage, and may be sown very early, for early use, and the last of May for autumn use.

7. BENE. This is highly esteemed, not only for the oil which is afforded by its seeds, but as beneficial in allaying local inflammation, particularly of children, in the bowel or summer complaint. A leaf of this plant immersed in a tumbler of water, transforms the liquid into a thin jelly, inodorous, and without taste or colour, which children will drink freely.

8. CABBAGE. Although this is a common garden production, very little attention is given to varieties, or to a succession for the table; and size is regarded rather than quality. Cabbages may be in use ten or eleven months in the year. The early sorts, if the plants are reared in a hot-bed, may be fit to eat in July, and Savoys keep good till May. Every farmer understands the culture of this plant; but few have experienced the advantages of transplanting them *twice*, i. e. first from the seed bed where they are generally crowded, and have crooked stems, into a bed of rich mould, at four to six inches apart, which is termed *pricking out;* and secondly, when they have there become thrifty, and of good size, into the place where they are to head. A hundred may be pricked out with a dibble in a few moments, and the plants are rendered doubly valuable by it. The dibble is a sharp pointed stick, with which a hole is made for the plant, and, when it is inserted in it, the earth is pressed to the root. The Savoy is the most delicate, and keeps best for late spring use. Cabbages keep well during winter in a trench, the heads down close together, and roots even with the surface, covered merely with earth; but they should be thus buried in a dry soil, and as late as possible before winter sets in. Cobbett recommends, as the best mode of preserving cabbages in winter, as follows:

"Lay out a piece of ground four feet wide, and as long as is required for your cabbages. Dig on each side of it a little trench, a foot deep, and throw the earth upon the four feet bed. Make the top of the bed level and smooth. Lay some poles, or old rails, at a foot apart, long-ways, upon the bed. Then put some smaller poles, or stout sticks, crossways, upon the rails or poles, and put these last at five or six inches apart. Upon these lay corn-stalks, or broomcorn-stalks, or brush of trees, not very thick, but sufficiently thick to cover all over. Then, just as the frost is about to lock up the earth, take up the cabbages, knock all dirt out of their roots, take off all dead or yellow looking leaves, and some of the outside leaves besides; put the cabbages, head downwards, upon the bed, their roots sticking up; and cover them so thick with straw as for the straw to come up nearly to the root of the cabbage. Do not pack them quite close. It is better if they do not touch each other. Lay some bits of wood, or brush-wood, to prevent the straw from blowing off. If the frost catch you, before you have got the cabbages up, cut them off close to the ground, and let the stumps, instead of the roots, stick up through the straw. Out of this stack you will take your cabbages perfectly green and good in the spring, when the frost breaks up; and to this stack you can, at all times, go, in the winter, with the greatest facility, and get your cabbages for use, which you can to no other species of conservatory that I ever saw or heard of. The hollow part below the cabbages takes away all wet that may come from occasional rains or melting of snows, and the little ditches on the sides of the bed keep the bed itself free from being soaked with wet. Even if deep snows come and lie for months, as in Nova Scotia, New-Brunswick and Canada, it is only removing the snow a little, and here are the cabbages always fresh and good."

We have no doubt of the utility of this mode; and to those who raise cabbages for winter and spring market, when the price is always high, Cobbett's directions are particularly worthy of attention.

9. KALE, is of the cabbage family, the leaves and sprouts of which are boiled in winter and spring as greens. There are several kinds, none of which that we have seen stand well our northern winters, which is required to have them useful. We have not seen the Siberian, recommended by Mr. Garnet. We might presume, from its name, that it would prove hardy with us.

10. KALE (Sea) has been highly extolled as a substitute for asparagus, and as coming earlier in use than that plant. We have tried it, but can say nothing in its favor, except it requires more labor than it is worth.

11. CAMOMILE is a medicinal herb of great use. There is a single and double flowering variety. It stands our winters tolerably well. A small root will increase to a bed in a season. The flowers should be gathered ere they begin to fade. The stems, gathered and dried, possess in a great measure the virtues of the flower.

12. CAPSICUMS. (peppers)—The large squash variety is used for pickles, the small bird kind for sauce. The seed should be sown early in fine earth. Where there is a hot-bed, it is well to sow in this. Thin the plants to eight inches.

13. CARROT. This, like the beet, is never lost to the grower; as it is readily eaten by most domestic animals; and is deemed equal to oats for horses. Sow in drills, in May, one foot apart, press the earth upon the sown seed, and thin the plants to five or six inches. The Altringhan and orange varieties are the best. ☞ The ground for all tap-rooted vegetables should be dug deep. A top-dressing of ashes is excellent for the carrot.

14. CAULIFLOWER. Although this plant is considered a delicacy, resembling much the brocoli, yet it is seldom brought to perfection with ordinary care. The French call it the flowering cabbage; and it may be managed like the cabbage, except that it demands much moisture and a rich soil.

15. CELERY is yet very little cultivated in the farmer's garden. Fifty plants will suffice for an ordinary family, and these may be raised in a trench of twenty-five feet. The seed should be sown early, if in a hot-bed the better, and the plants pricked out, as directed for cabbage. In July dig a trench a foot deep and a foot wide. Lay the earth upon the sides, or if more than one trench is dug, between the trenches, which should be five feet apart. Put into the trench rotted dung, or compost, dig it in, and set out your plants, six inches apart. As the plants progress in growth, draw the earth from the sides to the stems, taking care not to cover the heart, or central shoots; and continue this earthing, once in a week or ten days, till late in autumn, using as you have occasion. If covered so as to exclude wet, celery may be kept in the ground all winter; but the common mode is to preserve it in the cellar, by packing the roots in dry earth, or planting them in a trench. Some persons, who esteem the roots, plant on the surface of the ground, and do not earth the plants till they are removed to the cellar for winter use. These keep much the best.

16. CHIVES, often called sives, are perennial, and are often employed as edgings to walks. The tops are used in the spring in salads.

17. CORN. Early varieties, and particularly sweet corn, may be planted in the garden, for table use. Sweet corn may be preserved, when full grown, for winter use, and with dried beans, can be made into *succatash* at all seasons. Pick the corn when full grown, husk and place the ears in an oven, heat moderately; then take the corn from the cob, finish the drying process in the sun or an airy room, and pack it away for use. It will keep years.

18. CRESS, or pepper-grass, is a grateful salad, alone or with lettuce. Sow in drills very thick, and cut before it comes into rough leaf.

19. CUCUMBER. For an early crop, where a hot-bed is not used, dig holes in a warm part of the garden, put into each, half a barrow full of hot unfermented stable dung; cover the dung with six inches of good mould, and plant your seeds. Small boxes, with two to four lights of glass, are advantageously used to protect cucumbers and melons in May and June, both from cold and insects; and when once prepared may be preserved for years. The main crop, for pickles, &c. may be planted the first week in June.

20. DANDELION, although considered a pest, affords one of the earliest and best greens. It is cultivated in many gardens for this use. It may be slightly covered with earth in autumn, and in this way it becomes finely bleached. The French esteem it as a salad.

21. DOCK. The species called Patience Dock, of early growth and broad leaf, is often cultivated as a green. Six feet square upon a warm border will afford a great supply.

22. EGG PLANT. The fruit of this plant is highly esteemed by many. The seed should be sown early, if in pots in a hot-bed the better, and transplanted early in June into the open ground. Put the plants two feet apart each way. Care must be taken to protect the young plants from the black flea.

23. ENDIVE is principally cultivated as a winter salad. Sow early for summer crop, and the middle of July for winter use. To bleach endive, which adds to its value, gather all the leaves up with your hand when they are dry, draw them into a conical form, and tie them round with matting or a soft string. When they have remained in this state about a fortnight, they will be bleached and fit for use. The curled sort is the handsomest, the plain the best. For winter or spring use, the plants are taken up in the fall, with balls of earth, and placed in light earth in a cellar.

24. GARLICK, although seldom used as food by Americans, is nevertheless often in demand for medicinal uses. It is perennial and hardy. A few cloves or roots will occupy but a foot of ground and may prove serviceable.

Dairy Management in Scotland.

We have before us the report of the committee of the Highland Society of Scotland, by whom premiums

were awarded for butter and cheese. The report particularizes the deviations from ordinary practice of the successful competitors; and without affirming that these deviations were really instrumental in securing success, they deem them entitled to particular notice. We shall notice such of these details as seem most likely to be serviceable to our readers; and it will be remembered that they come from the successful competitors.

CHEESE MAKING.

Mr. Harvie keeps his cheese-house at the regular temperature of 78° Fahrenheit, throughout the whole season of cheese making, and executes the different processes of manufacture without delay. He thinks it impossible to produce cheese of fine quality and taste, without the use of the thermometer.

Mr. Harvie thus describes his modes of making double Gloucester, Stilton and Wiltshire cheese.

"*Double Gloucester cheese* is made from milk as taken from the cow, carefully put through a scarce [strainer,] into a tub of sufficient size for the cheese to be made. In the extreme of summer heat, the milk from the cow may be found too warm. It will be so if above 94°, but the temperature may be easily brought down by the addition of cold skimmed milk. The rennet is then applied, and, if good, the curd may be expected to coagulate in 20 or 25 minutes. The whey is taken away with a skimming dish, and the curd pressed with the hand till it becomes firm. The curd is then broken down with a double cheese knife, and put into a drainer with a gentle pressure above it. The curd is improved by washing with boiling water instantly drained off. The curd is then broken down as small as possible, salted, wrapped in a cloth, put into the cheese vat, [cheese hoop] and sent to the press. The cloth is regularly changed until it remains dry under the press, which is the only criterion to shew when the curd is sufficiently pressed. With the most expert cheese-makers, it may happen, that whey remains in the centre of the curd, which, if not quickly observed and removed, will crack and deform the cheese. An experienced person can detect this fault at an early stage, and by applying, for a short time, the cheese over the steam of a boiler, the whey will ooze out, and by the immediate application of the press, it may be all squeezed out. After the pressing is over, the cheese should be laid on a dry shelf, with a little fog or meadow hay under it to expedite the extraction of damp. The cheese should be turned daily, and well rubbed with a dry cloth, but after getting firm, once a week will be sufficient. It will be found a great conveniency to have a spare press, and cast iron presses are far preferable to others, as the pressure can be regulated in them at pleasure.

"*Stilton cheese* is made by mixing the evening's cream with the morning's milk, in the proportion of one gallon of cream to three gallons of sweet milk, and treated as above.

"*Wiltshire cheese* is made with new milk and cream, in the proportion of one quart of cream to two gallons of new milk, and treated as above."

Mr. Mackay, who received the first premium for his *skimmed milk cheese*, thus details his process—

"The cheeses were made from skimmed milk, one-half of which had stood 24, and the other half 12 hours, when both were carefully creamed, and one-half heated to a degree that will make the whole the requisite temperature. The milk, when thus prepared, receives the steep or rennet. A gill of rennet, made from a calf's stomach, will be sufficient for a quantity of milk that will make a cheese of forty pounds. After the rennet is put in, the milk must stand until it be all properly curdled. The curd is then broken very small with a skimming dish, and allowed to settle down till all the whey be taken off; it must then be cut with a knife in a drainer, and allowed to remain in it till properly cooled.—The curd must then be put into a vessel, and cut very small with a curd-knife, and a small quantity of salt used; it is again put into the drainer a second time, and allowed to remain there for the space of an hour. It is again taken out of the drainer, put into a vessel, well washed, and the requisite quantity of salt added. It is then put into a cloth, then in the cheese vat, and lastly in the press, and the cloth removed thrice a day, until the curd is properly pressed into a cheese."

Mr. Dickey heats his night's milk, for full milk cheese, to a temperature equal to that coming from the cow in the morning, before he adds the rennet. Mrs. Lumsden sets her milk, i. e. puts in her rennet, when the milk is at a temperature of 85°.

BUTTER.

Mrs. Macinnis, who received a premium, describes her mode of making and curing butter, as follows:—

"Earthenware vessels are used for keeping the milk, and placed in the dairy on cool stone shelves. The milk allowed to stand twelve hours, after which the cream is taken off and put into earthen jars, and made into butter the following day. The butter, when made, clean washed with spring water, and half an ounce of fine salt given to every pound of 16 ounces. It is then kept wound up with a cloth, as it accumulates for four or five days, when it is all worked together, and another half ounce of salt added to every pound, and packed into the vessel that is to contain it, with a wooden mallet made for the purpose. A little salt is sprinkled over the top, which is covered closely up, so as to exclude the air as much as possible."

Mr. M'Kenzie's milk vessels are all made of oak; the dairy-house stands in an airy situation, into which no one is allowed to enter but the dairy-maid. The milk vessels are always scalded in hot water, or steamed, before they are used.

"Joseph Leisk makes butter from cream and milk, because he considers it only practicable in large dairies to make butter from cream alone. The milk is put into large vessels, and left undisturbed for four or five days, until churned. It is necessary that the milk be actually *soured*, not thickened, otherwise it will not part with all the butyraceous matter; but it should be soured by natural, and not by artificial means, by letting it stand a sufficient time. Two or more milkings may be churned together, provided they are not mixed but in the churn. It is necessary to add warm water, to raise the temperature to 90°, otherwise the butter will not all be extracted from it. The butter is first packed in stone dishes, and afterwards in wooden kegs. The second packing gives an uniform color and taste to the butter."

William Merriless begins to churn his cream at a temperature of 56°, when churning rises it to 60°. He does not wash his butter; but it is beaten with the hand till it is completely cleaned of the milk.—The quantity of milk produced from cows fed on artificial grasses is much greater than that from cows fed on the hill; but the quality of the latter is much superior to that of the former, and yields much more cream. One pound of fine salt is allowed to one stone of 14 lbs. of butter. The butter is laid aside for two days, when it is again broken down, and beaten with the hand, and packed into small jars for family use.

A Hint to Housewives.

As greatly as we commend scrubbing, as promotive of cleanliness and health—and loth as we are to check any tendency to tidiness in our wives and daughters, we do believe that scrubbing our floors with water is sometimes carried to a prejudicial length. Ventilation, or pure air, is the first requisite to health and comfort; and dry heat, though it be uncomfortable, is seldom unhealthy. But moist heat is the bane of health. When, therefore, the floors, or even the hearths, of our apartments, are subjected to a weekly or daily drenching, in order that they may look neat and cleanly, they must be unhealthy. Now a portion of this water is converted into vapor, in proportion to the temperature of the room; and unless ventilation be given to a dry external atmosphere, the inmates of the dwelling must suffer, in a measure, the evils that result from a marshy residence. One of the most eminent surgeons of London, the late Dr. Taunton, has declared, that many an illness had been caused, and frequently death ensued, from sleeping in a bed room that had been scoured, and had not been thoroughly dried, before its occupant retired to rest. The preventive of the evil, consists in scrubbing during the prevalence of a brisk dry atmosphere, when the windows of the rooms can be freely opened; or in using *clean dry, or hot sand, instead of water*—a practice which is coming into use with high prospects of usefulness. Combe has furnished us with a good illustration of the advantages of using sand, instead of water, for purifying inner apartments, in a letter which he has published from Capt. Murray, R. N. That gentleman commanded a ship of war, on the West-India station. While five other ships in company, lost from sixteen to fifty men each, not one of Capt. Murray's crew, consisting of 150 officers and men, and although moored in the midst of the squadron, and having daily intercourse with the other ships—not one of Capt. Murray's crew died or was sick. He ascribed this happy exemption to the circumstance of keeping his ship clean and *dry*. "*Every morning the lower deck, cock-pit and store-rooms were scrubbed with dry holystones and hot sand, until quite white*—the sand being carefully swept up and thrown overboard."

The admonition which this fact affords, may prove useful to the master, as well as to the mistress, and should instruct him to keep the grounds about his house and out buildings free from filth and stagnant water, and to avoid building in marshy situations, if he would avoid sickness himself, and prevent it in his family.

Forcing Rhubarb.

Mr. Knight has left directions for having this excellent plant in use for winter. He gives the following *rationale* of the principles on which his practice is founded. "The root of every perennial plant contains within itself, during winter, all the organizable matter, which it expends in the spring, in the formation of its first foliage and flower-stems, and it requires neither food nor light to enable it to protrude these, but simple heat and water; and if the root be removed entire, as soon as the leaf becomes lifeless, it will be found to vegetate, after being replanted, as strongly as it would have done if it had retained its first position." His mode of proceding was literally to fill some large deep pots with the roots taken from the garden, in autumn. Some fine sand loam was then washed in, to fill entirely the interstices between the roots, the tops of which were so placed as to be level with each other, and about one inch below the surface of the mould in the pots, which were covered with other pots of the same size inverted upon them: being then placed in a vinery, where there was no light, and copiously supplied with water, the plants vegetated rapidly and strongly, and from each pot he obtained three successive crops, the leaf-stocks being crowded so closely as nearly to touch each other, over the whole surface of the pots. The heat of a hot-bed, kitchen, and, on the approach of spring, a cellar, will afford a sufficient high temperature. Tubs or other wooden vessels may be substituted for earthen pots. Plants which have grown one year in a rich soil, either from cuttings or seeds, will answer to force.

"Serious Suggestions Addressed to the Interests and Honor of Farmers."

Such is the caption of a very able article, addressed to the farmers of Kentucky, by the editor of the Franklin Farmer. Its object is to demonstrate the propriety of a more liberal state policy for the improvement of its agriculture, particularly by the establishment of schools of practical and scientific instruction. The certain tendency and sure effect of such a policy, it is contended, will be, to enlarge and elevate the science, i. e. the principles and practice of husbandry; to promote vast improvement in the modes of tillage, and all the departments of husbandry; to contribute the most effctual aids, physical and intellectual, to this great branch of industry, and to elevate the dignity and standing, in every sense, of the tillers of the soil. Commerce and manufactures, which, he adds, are subordinate interests, have received ample—we do not say unmerited—encouragement, while agriculture has been wholly neglected. And why, he aske, is this? It has been owing, he intimates, to the listlessness and indifference of the farmers themselves. He closes with the following appeal to their interests and patriotism:

"Now we ask the farmers of Kentucky, each and all; have you done your duty to yourselves, to your sons and to your country, in regard to the great measures in which you are most deeply interested? Have you done enough for the promotion of agricultural education—have you felt and *acted* as if you felt, that your pursuits are the most important and dignified of all that engage the labors of mankind? Have you been willing, or at least, inactive spectators, of the course of legislation, which has passed by the interests of agriculture, unnoticed? Have you stood by and witnessed acts of favor extended to every other pursuit, and your own neglected as if unworthy of attention? Have you ever, as a freeman of this republic, and having the right to instruct your representatives, urged them to support measures of legislation in favor of agriculture; or rebuked or reprimanded them for their disobedience? Have you done nothing for the encouragement of agricultural education? Have you never felt, that in your pursuits as a farmer, in your actions as a citizen of the country, in your discipline as a father;—that you owe a great moral debt to your contemporaries, to your country and to your children, which cannot be discharged but by engaging heartily and earnestly, with all your ability and energy, in the labors which we have suggested? If you return a negative response to these inquiries, you have failed to sustain the high dignity and character of your position in community. You have met, as meets a coward, the noble responsibilities imposed on you by your existence in the nineteenth century, in this age of onward and upward march to the highest point of prosperity and improvement in all that relates to the happiness and well being of your fellows. You have, in short, sunk below the standard which the age has excited for the measure of your standing in community. But notwithstanding this dark picture, there is a day of brightness dawning, whose light will allure to press you onward in the paths of national and individual prosperity and honor. You cannot longer remain in the rear. Your post is in advance; and you must occupy it. The age expects you to transmit to your sons, such an amount of useful, practical knowledge, and withal, such a spirit of pride in your pursuits, as will testify that you appreciate the value of one to the success of the other; and such as will render your sons honorable and useful members of community. You are to demonstrate, in short, by every means and in every action, that your character and pursuits are the most exalted and dignified, and that you *know* it, and appreciate your position rightly. With these remarks we leave you for the present to the responsiblity you owe yourselves, your children, your country and your God."

The example of Massachusetts, in encouraging the improvement of agriculture, we hope at least will arrest the inquiry of all Legislators, as to its tendency upon the interests of the State, if it does not induce them to imitate it. The state agricultural society of that state has offered premiums to exceed $2000, and six of her county societies give each over $600. These premiums have been awarded for several years principally through the wisdom and liberality of her legislature; and no one murmurs—all classes are pleased, because all classes, either directly or indirectly, participate in its benefits.

On the Practicability and Means of Improving our Agriculture.

An Address, delivered before the Fulton County Agricultural Society, on the occasion of its organization, at Johnstown, Oct. 18, 1838, by J. Buel; *published at the request of the Society.*

Gentlemen of the Society—To those who can carry back their recollections thirty or forty years, the improvements which in that time have been made in the mechanic and manufacturing arts will appear surprising. Forty years ago we imported all our cotton, and most of our woollen goods, except of household manufacture—all of our hardware and cutlery, a great portion of our nails, saddlery, hats, &c. and I well remember, that a hatter in Albany, to give currency to his hats, was obliged to deceive his customers, by putting into them bills, representing them to be of British fabric. Now most of these, and many other articles indispensable to our comfort, are not only produced within ourselves, in quantities sufficient for domestic use, but millions in value of them are annually exported to foreign countries. Not only are they produced in abundance, but they are produced at a far less price than formerly. East India hum-hums, a coarse slazy kind of cotton goods, were once reputed cheap at twenty-five cents a yard. We have now better goods, made at our mills, at six and seven cents a yard; and it is but little more than twenty years, since the invention of power-looms reduced the price of weaving from eleven and twelve to one and two cents a yard. There is scarcely a manufactured article in use, which has not, in consequence of the improvements in mechanics and manufactures, been improved in quality, and diminished in price.

Whence these great and recent improvements in our sister arts? They are not owing to the diminished price of labor; for that has increased, rather than diminished; nor to a reduction in the price of provisions—for these, too, are higher than formerly. They have been brought about by the diffusion of useful knowledge, and the consequent development of the powers of the mind. The manipulations in the arts have been greatly abridged by labor-saving machinery, and many of the processes have been simplified and cheapened, and the results rendered certain, by the aid of science—by a knowledge of those laws which Providence has ordained for the government of matter, inorganic, as well as organic. Mind has been put in requisition, as well as physical power. And these changes have in some measure been effected by a more systematic arrangement of business—by a division of labor—and by a general and rapid dissemination, by means of the press, of a knowledge of the improvements which are every day being made in these useful arts of labor.

Let us now turn to agriculture, the parent of all arts—the source of our purest and most substantial enjoyments—the basis of our national prosperity and independence. This is as susceptible of improvement as the other arts of labor. What progress in its improvement have we made, during the last forty years? Have our labors been abridged by the general introduction of improved labor saving implements of husbandry? Have our lands increased in fertility, and in the amount of their products? Has the diffusion of useful knowledge, in the business of husbandry, been as extensive as it has in the manufacturing and mechanic arts? The valley of the Mohawk was long ago celebrated for its fertility and its wealth. Have enterprise, intelligence and improvement, in rural affairs, kept pace with the spirit of the age? I fear these questions cannot be answered affirmatively. I fear that it will be found, on an impartial investigation, that while all the other arts of labor have, with rapid strides, been progressing in improvement, our farmers have too generally been taking a Rip Van Winkle nap;—that with all the natural means of improvement, and all the common incentives to employ them, they have been listlessly treading in the footsteps of their fathers, unmindful of the salutary changes which are enlightening and enriching those engaged in other branches of labor.

I have said that agriculture is susceptible of improvement, and that our farmers have the power and incentives to bring it about, if they would do as others do, make a joint stock of their knowledge, and thus individually profit by the experience of all. Scotland, in a little more than forty years, has increased her agricultural products four fold, and yet but few of her farmers are owners of the land they till. They are tenants at a heavy rent, which Prof. Low, one of her late agricultural writers, averages at more than eight dollars an acre per annum, while the burdens, in the form of taxes, are assumed by him to be about $140 upon a farm of 500 acres. Thus the occupant of such a farm pays annually, in rent and taxes, about 4,500 dollars, which of course is a draw-back upon his nett profits, and most of which the American farmer, with Scottish intelligence and industry, might annually add to his income. Yet the Scotch farmer prospers under all these disadvantages.

What I have remarked of the increased profits of Scotch agriculture, will apply with very little abatement, to many districts of our country, and particularly to the county of Dutchess, in our state. Entire farms in that county have netted the cultivators an annual profit of fifteen and seventeen dollars an acre. Forty years ago these farms did not probably nett a quarter of this sum; and if I am able correctly to identify one to which I make reference, it was, forty years ago, mostly *old field*, a term denoting worn out land, and was lying in commons!

One of the best farmers of the age, a man of science and extensive practical knowledge in farming, has affirmed, that by doubling the expense, in labor and manure, he has, upon the same land, been enabled to treble his profits, and to quadruple his products. I allude to Von Thaer, who has for twenty-four years been at the head of the great agricultural school in Prussia.

If I might be permitted, without being charged with egotism, to cite my own experience in the business of improvement, I would point to my farm, on the Albany barrens, which many of my hearers have seen, I presume, in its present and former state—as a further evidence that we *can* improve our lands. Twenty years ago, my soil was poor,—very poor—and my farm a part of the commons—a waste. It is now as productive, and its culture affords as liberal a profit, as any of the lands in yonder fertile valley. It is worth, for farm culture, the interest of two hundred dollars per acre; and this year the product has been greater than I have named, although but ordinary labor was bestowed in the culture. It may be said that I have expended capital in my improvements. This is true. I laid out extra money and labor to put it into good condition, and I am now realizing compound interest upon the amount of the outlay: For having *put it* into good condition, I am enabled to *keep it so*, and to cultivate it, with as little expense as I could cultivate poor lands that would not yield me a third of the profit that I now realize. Capital is useful to its owner in proportion to the income which it brings him; and if by vesting it in farm improvements, it is made to yield as much as it would yield in bank stock, or loaned on bond and mortgage, it would seem to be prudent, if not wise, so to vest it.

I believe it will not be denied, by any one conversant with the history of the times, that improvements in *our* agriculture have been trivial, compared with those which have been made in the other arts of labor, or those which have been made in husbandry in other districts and in some other countries. On the contrary, it is but too apparent, that, with individual and local exceptions, our old lands have been deteriorating in fertility without any material improvement in the mode of their culture. A bare reference to the wheat crop in the valley of the Mohawk, comparing it now with what it was forty years ago, will serve to substantiate this truth.

From the examples I have cited, and from the personal observation which most of you have been enabled to make, I think it will readily be admitted, that we are capable of greatly improving our farming operations, and of thereby adding to our wealth, our comforts, and to the substantial prosperity of our country. If by means of new farming implements—the improvement of our domestic animals—and a better system of culture—the labor which now netts us fifty dollars, can be made to nett us one hundred dollars—which I consider within the range of probabilities—we may then double both our products and our profits; and, under the guidance of correct principles, double, too, our usefulness to society.

The progress of improvement in husbandry, will be graduated, in a measure, by the degree of intelligence which directs its labors. "It appears to be strange—and yet we see it to be true"—says the Rev. C. Young, "that the more ignorant a man is, the more obstinately is he wedded to his own notions and ways—the more ready to scoff at and oppose every thing that is new. Self-conceit and prejudice, the greatest foes to improvement, are the legitimate offspring of ignorance. And in proportion to the degree of ignorance, in a community, will be the hostility to improvement, and the derision, and even persecution, at which all attempts at innovation and reform will be met. The spirit of improvement is thus cowed, and even smothered. And if occasionally, a bold genius struggles into life, and exhibits his inventive powers, he hazards his peace—sometimes even his life. When Hargrave, less than a century ago, attempted to introduce the spinning-jenny, which he had invented, into the cotton manufacture, he was obliged to fly from Lancashire in England, where he lived, at the risk of his life. The first saw-mill ever erected in England was destroyed by a mob, because they thought it would take bread from the families of the sawyers." Fortunately in our day and country, acts of violence towards innovators upon old modes of farming are not to be apprehended. We can only complain of a listless indifference to improvement, and of a conceited ignorance, which rejects the useful, because it is new.

If our neighbor discovers on his farm a valuable mineral, and works it to great profit—we commend him for his good fortune. If the like mineral abounds on our own farms, and we can work it to equal advantage, what course, as prudent men, ought we to pursue? Should we not deem the man highly reprehensible, who neglected such an opportunity of adding to his wealth, by adopting the example of his fortunate neighbor? Now what are our farms but mines of wealth, if rightly improved? They are certainly so to many cultivators; and if we will follow their example in working the mine, and in husbanding the wealth which it yields, our farms will be such to us. If we lack the knowledge which precedes improvement, let us seek for it, by observation, by study, and a mutual interchange of opinions and information, with our brother farmers in associations like the one I am addressing. We shall see and hear, at these meetings, much that is new,—much that is instructing and useful, and much to stimulate us to new exertions in our business.

Again—if a man embarks in a speculating business, and prospers in it, how ready are his neighbors to become his rivals and competitors? Good farming is a speculation—with almost a certainty of gain—without the probability of loss. In agriculture, besides, competition excites no unkind feelings, as it is apt to do in other employments, or should not, for the improvements of every competitor may prove beneficial to all. What one makes does not lessen his neighbors' profits; but, on the contrary, has a tendency to better the condition of all around him. There is no monopoly in good farming.

The propensity which has too much prevailed of late years, to quit farming for a more lucrative, a more genteel, or a less laborious employment, has been a great obstacle to agricultural improvement, and has tended much to lower the respectability of our yeomanry in the public estimation. How many farmers have we seen, who were doing well upon their farms, allured by a weak ambition, into some untried business, in which they had every thing to learn—how many such, I say, have we seen bankrupted in fortune, and not unfrequently in reputation. There is a vast difference in the chance of a man's improving in the business to which he has been brought up, and his succeeding in a new one, of which he knows little or nothing. In the one case he has a capital in his experience; in the other, he enters into competition, without this capital, with those who are far his seniors in skill and in practice. A farmer may *improve* in his *old* business, at much less risk, and with less trouble, than he can *learn* a *new* one. He mistakes equally his interest and his happiness, therefore, who quits his farm, or neglects to improve it, upon the untried experiment of doing better elsewhere. There is no employment which promises a greater portion of health and independence, the main sources of our enjoyment, than that of agriculture; while the return it makes, to skill and industry, is as bountiful, probably, as is useful to ourselves, our families or our country.

The first step to improvement, is to acquire better knowledge in our business;—the second, to apply this knowledge to the management of our farms. He that is conscious he *can* improve, and resolves that he *will* improve, will most surely succeed—and the means of improving will readily present themselves to his mind. Agricultural journals will afford him a ready and cheap means of instruction. They chronicle and bring to him, periodically, at trifling expense, the improvements that are continually being made in the business by which he lives, and expects to acquire wealth for himself and his children. They convey to him all the discoveries in the science, and improvements in the art of agriculture, which are made in Europe or America, and that are calculated to improve him in his business, and advance his condition in life. They explain to him the principles upon which the new system of husbandry is more productive, more certain, and more profitable, than the old system; and they demonstrate the correctness of these principles by the successful results they give in practice. They explain to him the operation of manures—as essential to the growth and perfection of his crops, as hay, grain and pasture are to the growth and productiveness of his cattle—and enlighten him in the means of augmenting, and of applying them in the most economical manner. They bring to his knowledge every improvement and invention in the labor saving implements of the farm. They instruct him in the principles and most approved modes of draining—and of rendering salubrious and productive, those portions of his farm which have hitherto, perhaps, been a prolific source of disease and death to his family, and neighborhood—a highly useful branch of modern improvement in husbandry, which we have yet to learn. They demonstrate to him, in principle, and by numerous illustrations in practice, the utility of alternating crops, and instruct him in the economy and management of root culture. They treat of the comparative value of different breeds of farm stock, and furnish the best examples of profitable management. They teach useful lessons in gardening and orcharding, and designate the fruits, roots and garden productions most useful to the family, and most profitable for market. They abound in instructions in household economy, and show, that under judicious management, the garden and the farm may be made to produce most of the necessaries, and many of the elegancies and luxuries of life. They are in fact a sort of agricultural museum, in which all that is new—all that is useful in farming—may be found, and applied to the individual benefit of the reader. They are, in effect, a sort of universal agricultural society, which collects into a focus, and from thence diffuses over the land, a knowledge of all that is useful in the improvement of the soil. But independent of these, and other advantages I might particularize, agricultural journals are worth thrice their cost to the children of the family, in inducing in them a taste for useful knowledge, and a desire to improve their minds, their manners and their morals. The good seed, sown in the spring time of life, will produce its fifty and its hundred fold, in the summer of manhood.

Another and very important means of improvement is agricultural societies or associations. Although these have been of long standing in Europe, and have contributed largely to agricultural improvement there, more new ones have been formed in the United States, in the last five or ten years, than ever existed with us before. They afford a strong indication that the important business of husbandry is commanding, as it ought, the particular attention of the American people; and that the benefits resulting from these associations have become palpable and important. Agricultural societies tend to bring under the eye, or to the understanding, of each member, and in a great degree to the public at large,

the best household and farm products, and the best agricultural practices, of the country or district in which they are established, and thus enable each individual to appropriate to his own use, the experience and the improvements of his neighbors. The example of every good farmer produces a beneficial influence upon those around him; who seeing his approved modes of management, and the advantages resulting from them, will not fail ultimately to adopt them. Hence the more good farmers there are, the greater will be the ratio of general improvement, and consequently of public benefit—for it is the earnings and products of agricultural labor, that mainly contributes to the prosperity of the other classes of society, and to augment the aggregation of the national wealth. When the harvest is short, every department of business feels the electric shock. When it is abundant, a new and happy impulse is given to every sort of business. These considerations show, that it is the interest alike of all, to patronize and encourage every effort that is made to increase the products of the soil. One of the oldest societies in our country is that of Berkshire, in Massachusetts. I have occasionally attended their exhibitions, traversed the county, and marked its improvements in husbandry, during the last twenty years; and I feel a perfect conviction in my mind, that the county has been benefitted twenty dollars for every dollar expended in premiums, in a pecuniary point of view. But it is not the rapid improvement of the soil alone which has resulted from the establishment of her agricultural society—the improvements of the mind have kept pace with, or rather preceded, the improvements in her husbandry. That county has probably the best schools in the country; and the general intelligence of her population ranks high.

Among other benefits likely to result from the establishment of agricultural societies, Mr. Anderson, in a late address, before the society, at Danville, Ky. enumerates the following.

"They will elevate the character of the farming and agricultural class of society. They will increase their general intelligence, their aggregate wealth, and give them, as they deserve to have, a control over the morals and politics of society.

"They will increase the national wealth.

"They will be not only calculated to elevate the character of agriculture, but the standard and spirit of education; for as men increase in knowledge even of a useful character, aspirations to a higher standard in every thing else, are enkindled.

"They will furnish essential aid to the legislature of a state.

"They will greatly increase live stock, in purity of blood and quality.

"They will increase labor saving modes of cultivation, as well as labor saving machines."

As intimately connected with the improvement of husbandry, which this society is specially formed to promote, permit me earnestly to recommend an early attention to the establishment of Common School Libraries. The improvement of the mind must precede the improvement of the soil. Physical power belongs to the brute, as well as to man; but the application of intellect to aid and control this power, is the peculiar prerogative of man; and it requires no argument of mine to show, that intellect is efficient and potent, in husbandry, as it is in the other business concerns of life, in proportion as it is brought under good culture;—that a well cultivated mind, like a well cultivated soil, can be rendered far more productive in usefulness, than one that has not received the advantages of culture. Common School Libraries will not only be useful in the particular business of farming, but in all the relations in life in which we or our children may be called upon to perform a part. All the gradations in society, from savage life, to the highest state of civilization and refinement, have principally been owing to the greater or less cultivation of the human intellect. Useful reading not only confers postive benefit, by the instruction and admonition which it imparts, but it often averts positive evil, by keeping us from loose or bad company, and thereby preventing the formation of idle or bad habits. The youth who finds pleasure in reading, and has the opportunity of storing his mind with useful knowledge, will seldom be driven to the haunts of vice and dissipation, to indulge his grosser appetites. And the mind too, like the soil, will grow weeds and briers, thistles and thorns—if not made, by good culture, to produce that which is comely and useful. The liberal appropriation by the legislature, for the establishment of Common School Libraries, if seconded, as I trust it will be, by the public at large, will form a new and auspicious era in our history, and contribute essentially to render us, what we ought to be—a more intelligent and virtuous—that we may longer reman a free and independent—people.

The judicious cultivation of the soil is now deemed so essential to national prosperity, that it has become the settled policy of the most enlightened governments, to take a direct and efficient interest in the improvement of its agriculture. Schools of scientific and practical agriculture, in which youth are taught the best modes of practice, and instructed in the principles upon which that practice is based, are continually multiplying under governmental patronage on the old continent. National societies have been established for rewarding those who benefit the state by their improvements and discoveries in husbandry, and for diffusing the useful information which is thus brought to a common centre—and the rewards as well as the services of those who are thus engaged in promoting the common weal, are in most cases paid from the public treasury. Prussia has wisely engrafted instruction in agriculture upon her system of common school education; and even in what we have hitherto considered the benighted regions of Prussia, and among the oppressed of Ireland, we see evidences of wisdom, and the dawn of a brighter day, in the establishment of agricultural schools. Our sister state, Massachusetts, has been foremost among us to adopt a liberal and enlightened policy toward this her primary branch of industry. She has disbursed large sums from her state treasury, annually, to sustain and encourage county agricultural societies; and when the law making these appropriations, was about to expire, by its own limitation, so well satisfied was her legislature, of its utility, that the law was renewed with great unanimity. That state has also provided for an agricultural survey of her territory, which has been two years in progress, with a view of bringing before her whole agricultural population all that is found excellent in the business of her farming population. How far New-York will profit by these examples of usefulness—or when she will begin to imitate them, will depend very much upon her farming population. What they *demand* will be granted. But little need be expected for the promotion of agricultural improvement from our public councils, while the farmers themselves generally manifest a reprehensible indifference in the matter.

In the brief remarks I have made, I have endeavored to show the practicability of improving our agriculture, and of thereby raising the character of our agricultural population; and have suggested some of the means by which the desired improvement may be brought about. I have already trespassed too far upon your patience, I fear, to go into any of the details of improved husbandry. Let it suffice to say, that they embrace a better economy, and more general application of manures—a system of thorough draining—the introduction of improved labor saving machines and implements—the improvement of farm stock—the exclusion of impure seeds—the extension of root culture—the alternation of crops where practicable—the improvement of our common roads—the introduction of system into all the departments of farm and household labor—the cultivation of *as much land as can be cultivated* WELL—and the keeping of *as much farm stock as can be profitably fed and fattened*—AND NO MORE. All those improvements *have been made*, and *are making*, elsewhere. They *can* be made here; they *will be made here*, by the intelligence, the enterprise, and the laudable competition, which this society will diffuse and call into action, if its labors are judiciously persevered in.

I am happy to recognize, gentlemen, in the formation of this association, a disposition in its members to aid in the work of agricultural inprovement. The object is a worthy one, because it aims to enlarge the means of human sustenance and the measure of human enjoyment; and by encouraging and honoring industry, tends to advance the moral character and substantial prosperity of the country. I hope you may prosper in these public spirited efforts, and that FULTON county, may become as distinguished in the annals of agricultural improvement, as the individual whose name it bears, is already renowned in the history of steam navigation.

Notices to Correspondents.

MADDER. W. R. of Gloucester county, N. J. will find the information he asks for, in regard to the cultivation of madder, at pages 35 and 141, vol. I—at pages 20 and 171, of vol. II—and at pages 72 and 189 of vol. III. It would be an unpleasant repetition, to most of our readers, to republish these directions.

LIME AND MARL. A correspondent at Washington, D. C. writes as follows:—"The application of lime and marl, in Maryland and Virginia is producing wonderful results. I have no doubt, that in a few years, all our worn out exhausted lands, will rank among the most productive in any part of the United States, by the judicious application of those two valuable calcareous manures, or rather agents in agricultural improvement. I am engaged in applying lime to a small exhausted farm near this city. So far the effects are great. So far as I shall have a full and fair experiment of the results, I will make them known in detail, through the columns of the Cultivator, if they shall be deemed worthy of insertion. I am making the experiment, whether lime applied on poor exhausted land, in very small quantities, unassisted by manure, will *alone* recover the land, except that taken from swamps, or in other words, rich rotted vegetable matters. I try the lime alone also. What is your opinion on this point?" Our opinion is, that lime must have vegetable or organic matter to work upon, to restore fertility to the soil. If our recollection is right, the soil about Washington is a tenacious red clay, so hard, when dry, as to prevent the plumules of tender plants penetrating it freely. Lime will unquestionably improve its mechanical texture; and if brought in contact with inert vegetable matter, whether already in the soil, or brought thither from swamps, it will improve its fertility, in proportion to the vegetable matter which the lime may render soluble, and thus transform into vegetable nutriment.

PEAT SWAMPS. Willard Earl, of Hubbardston, Mass. will find as ample directions as we can give, for reclaiming peat swamps, at pages 157, 174 and 190 of our last volume. The first thing is thoroughly to drain them, so that water will not stand and stagnate within the natural range of the roots of farm crops. The second requisite is, to induce a decomposition of the vegetable matter, by paring and burning, by the application of lime or unfermented manures, or by a liberal admixture of earthy matters. The third is, to till and subdue the upper stratum till it is fit to lay down in meadow. The fourth is, if it is to be kept in meadow, to give it a top-dressing, once in three or four years, with manure, compost, ashes, lime or marl. We have yet much to learn in draining. We do not go deep enough; and we have yet to learn from experience, that under-draining, except upon the main outlets, is far the most efficient and economical.

MARL. Theodore Allen, of Hyde-Park, Dutchess, writes us, that he has just opened a bed, extending over several acres, and lying within twenty rods of the Hudson, of what he believes to be *shell marl*, and has sent us a sample of it. Without having subjected it to an accurate analysis, we venture to assure Mr. Allen, that the specimen is shell marl, of superior quality, and that in his "several acres" he has a source of great fertility and profit.

PUMPKIN, SQUASH, &c. A correspondent inquires of us where the seven years, and mammoth pumpkins originated, what are their qualities, &c. We cannot answer either of these questions. We have grown both, but have thought so little of their quality, from their appearance, that we have not had any of them cooked. Another equally puzzling question has been asked us, viz. what is the distinction between a squash and a pumpkin?

The pumpkin, squash, water-melon, gourd, and we believe what is termed the vegetable marrow, belong to the same class, or family of plants (*Cucurbita*); and although there are but six species described by botanists as belonging to this class, there are innumerable varieties, partaking of the qualities of two or more species. The species named by Eaton, are, the egg squash, club squash, flat squash, pumpkin, water-melon and gourd. Instead of giving three species of the squash, Loudon gives three of the gourd, and one of the squash. All the varieties of pumpkins, squashes, water-melons and gourds have sprung from a mixture of these six species; and but few of the varieties held by us in the highest estimation answer the description in fruit, given in books—so remarkably have the varieties multiplied, and in many cases improved, by cross impregnation. We have apparently six varieties now growing in our garden, from seed which we planted as the apple bush squash—in consequence, we presume of the parent having been grown along side of other varieties and species. The pumpkin is cultivated in England as a curiosity; yet, says Loudon, some of the inhabitants grow it on dunghills, and "when ripe, they cut a hole in one side, and having taken out the seeds, fill the void space with sliced apples, adding a little sugar and spice, and then having baked the whole, eat it with butter." Poor souls! not to know the luxury of pumpkin-pie!

The vegetable marrow, being of recent introduction, having been first obtained but a few years since from Persia, and being withal an excellent species, we will copy its description from Sabine, and his directions for preparing it for the table.

"The fruit is of a uniform pale yellow, or light sulphur colour; when full grown it is about nine inches in length, four inches in diameter, and of an eliptic shape, the surface being rendered slightly uneven by irregular longitudinal ribs, the terminations uniting, form a projecting apex at the end of the fruit, which is very unusual in this tribe. It is useful for culinary purposes in every stage of its growth; when very young, it is good if fried with butter; when large, or about half grown, it is excellent either when plain, boiled, or stewed with rich sauce; for either of these purposes it should be cut in slices. The flesh has a peculiar tenderness and softness, from which circumstance it has, I suppose, received its name, much resembling the buttery quality of the *beurre pears*, and this property remains with it till it is full grown, when it is used for pies. It is, however, in its intermediate state of growth, that I consider it likely to be most approved. Compared with all the other kinds which I had growing, its superiority was decided. I consider the vegetable marrow without a rival."

We have grown the true vegetable marrow two seasons; and although we have not used it in the intermediate state of its growth, as recommended by Mr. Sabine, we esteem it among the best varieties of the cucurbita for boiling and for pies. It is cultivated like the common pumpkin or squash, and will ripen in a high latitude.

INDIAN CORN IN ENGLAND. We are asked by a Kanawha, Va. correspondent, if Indian corn is grown in England? It is *not* grown there as a *crop*, but occasionally as a *curiosity*. Loudon says, it *may* be cultivated in very warm, dry situations, if the dwarf red grained be adopted. Cobbett did grow and ripen some; but no attempt, we believe, has been made to profit by his lessons, farther than to raise a few hills for the table, while green.

Will ruta baga do as well on stock ground as on sod? is a question addressed to us by D. J. Bent, of Chester, Pa. We think it will, if the former is made as rich as the latter, including the fertilizing matter of the sod. A sod is beneficial in two ways: it affords the food of plants, and it tends, if left carefully turned, to mitigate the effects of drought. The decomposition of vegetable matter, excluded from the atmosphere, not *only preserves*, but *produces*, moisture. Mr. Bent also asks—will manure, applied in an unfermented state to corn, in the spring, benefit a succeeding wheat crop, as much as it will if permitted to rot in the yard, and applied after the corn is harvested? We answer *it will, and more.*

It loses less by fermentation in the soil than it does in the yard, and it is better commingled with the soil by the culture of the corn, than it would be by the mere preparation for the wheat crop.

CORRESPONDENCE.

Plan of a Barn.

Near Brownsville, Pa. Nov. 1, 1838.

Hon. J. BUEL—As the important subject of barn building has awakened the attention of the farming community, I would place at your disposal the plan of a barn I have just erected. It is the plan most usually adopted by the Germans of western Penn. The cost is about eleven hundred dollars; and for extent of accommodations, for grain and stock, for durability, for convenience and not being liable to get out of repair, it has few superiors. Bank barns have many advantages over those erected on level ground, and surrounded with sheds,—the manure is collected in front, in one place, and all other sides are kept clean; the stock is more easily fed, on account of the fodder being nearer to the place where it is wanted, and much less roofing is required for the same purpose. This barn is ninety-five feet long, forty-four in width, including an overjet of eight feet: height of main frame sixteen feet, and of the overjet twelve; that is, above the wall.

[Fig. No. 61.]

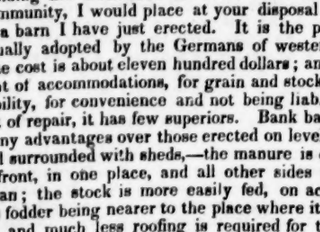


Fig. 61, represents the end view. Several lattice windows are preferred, so as to let off the rarified, moist and heated air in small bodies; for a current of this air is known to be one of the best conductors of electricity; of course then, means should be taken to prevent its passing off in one dense volume; free ventilation would seem to answer this purpose. Is not the neglect of this precaution the cause of so many barns being burned by lightning? the whole current passing out of one opening?

[Fig. No. 62.]

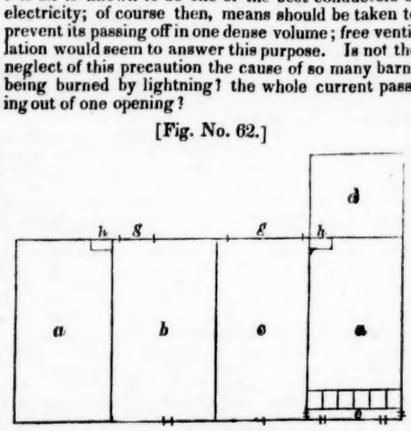
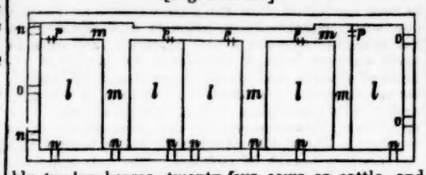


Fig. 62, represents the second story; (xa and a) represent hay or grain mows; (b) a mow with large doors (g), and strong floor, into which a wagon can drive so as to fill the mow (a); after which the mow (b) may be filled from the threshing floor (c); so that no space in the whole extent may be left unoccupied, except the threshing floor; and after the mow (b) is freed from its grain, it also serves for a threshing floor for the mow (a). The mow (a), however, is intended for hay, which even then leaves space enough for all the grain of farms of the usual size; (e) is a granary, from which grain may be let down into a wagon, from a door in the end of the barn; (d) is a building for a stationary horse power of a threshing machine, which I intend erecting; (g g) are barn doors; (h) stair and gangways to throw hay and straw into the stable below. A straw house on the lower side with racks underneath, will be found very convenient, especially where much straw is threshed at one time. Joists are placed above the threshing floor on which to store away grain.

Fig. 63, is a ground plan of the basement story; (m) are passages the whole length of the building, and between the stables, from which the stock is fed; (n) passage and stable doors; (o) windows, which together with lath doors, and the space up to the sills above the doors being left open, serve to ventilate the stables sufficiently; (p) doors from passages into stables; (l) which will accommodate comfortably twelve horses, twenty-four cows or cattle, and twelve calves. The basement is mason work. I am thus minute, for in minutiæ consists convenience.

[Fig. No. 63.]



A Machine for Hoisting Logs.

I will also attempt to describe a machine for raising logs upon a wagon, with which a man and boy to move the pins, can load a log in five minutes, which

[Fig. No. 64.]

it would require five men at least half an hour; (a) is the log, (b) a lever, the handle being wood, the part (g) on which the strength lies, of iron; on which iron part, is fixed a link and hook; (c) is two pieces of plank about seven feet long, eight inches broad, and one and a half thick, pinned side by side,—but wide enough apart to admit the lever and hook working easily between them,—bored with holes at regular distances on each side, so that as the lever is raised and lowered, the pins which go through the holes, and on which the lever rests, may be moved to the holes immediately above; the hook on which the weight lies, works between the two pins; (e) is a stick, one end on the ground, the other on the log; on which latter end is fastened a log chain extending under the log, and fastened on the hook of the lever; (d) is a prop to keep the machine from falling in the direction of the log. It works on much the same principle as the beam cider press. If you understand the principle, please explain it in a more intelligible manner, if it is deemed worthy of a corner of your valuable journal.

G. E. H.

Improved Wind-Mill.

Mr. J. BUEL—Sir—I wish through the columns of the Cultivator, to bring to the notice of the public an important improvement in the wind-mill, made by Mr. Israel Keyes of Putney, Vermont, and patented by the United States. It is believed that by the aid of this improvement, wind power may be successfully used in all those places where water power is wanting.

The wheel used by Mr. Keyes, is a perpendicular wheel moving horizontally. There is a perpendicular shaft, with two setts of horizontal arms, to which are attached boards perpendicularly, which make the floats on which the wind operates. This wheel is enclosed in a circle of slats standing perpendicularly, and turn on a pivot at the bottom. Each slat laps on the edge of the one next to it, so that the circle is easily moved; and opens and shuts in the manner of moveable window blinds. In whatever direction the wind may blow, it operates upon one-half of the wheel, while it is turned from the other half: and when the wind is too violent, the slats are partially or wholly closed, as the case may require, by the operation of the machinery; so that the operation of the wind on the wheel, can be regulated as water is by the opening and shutting of the gate.

It is believed that this wind-mill may be successfully used for grist-mills, saw-mills, for mechanic shops, for grinding bark in tanneries, for the various purposes of farm use, as grinding provender, sawing wood, cutting straw, turning, or a churn, and for pumping water.

Mr. Keyes has erected for me a wind-mill, with a four feet wheel, to carry a pump of one and an eighth inches caliber; and the experiment has been entirely successful. It has much more power than is needed for so small a pump, in a well of common depth.

It heaves three quarts of water in a minute, and with a larger pump would probably heave two gallons in a minute.

This pump can be fitted up at a moderate expense, and cannot fail to be a valuable acquisition to those farms that are destitute of streams and living fountains.

This improved wind-mill has many advantages over those of the old construction, as will be obvious by inspection. It is cheaper built, in a more convenient form, has much less friction, more power, and is perfectly managable in a high wind.

E. D. ANDREWS.

Pittsford, Monroe co. Nov. 12, 1835.

A model of this wind-mill has been submitted to our inspection; and we are inclined to think favorably of it; though we cannot venture to give a definitive opinion of its merits till we have seen it thoroughly tried.—*Cond. Cult.*

Cultivation and Profits of Cucumbers.

Narrows, L. I. October 26, 1838.

Mr. BUEL—Agreeable to promise, I will now endeavor to describe the manner in which cucumbers are cultivated on Long-Island, for the supply of the New-York markets, and will also give the produce and amount of sales from my crop of the preceding four years. Before proceeding with the matter, I would state, that the description is intended for field culture, and that our great object is, to have good fruit, and as early as it is possible to produce it, for two or three days makes a great difference in its value in the markets.

Cucumbers will grow on any good soil, but to have them early, we require a rich sandy one, of a dark colour, yellow and light coloured ones being later.—The field, if possible, requires to be protected from the south and northwest winds, and be situated near the bay or river, where there is always less danger from late frosts. The south winds with us, in May and June, retard vegetation more than any other, in consequence of their being chilly and cool, which qualities they receive from the ocean.

Ground intended for cucumbers, we prefer ploughing in August or the beginning of September of the preceding year, and sowing with rye; the pasture which this produces pays for the labor, and among its advantages are, the prevention of weeds going to seed and troubling us in the spring; the soil not blowing about in winter, especially on the knolls; neither is it so liable to blow when ploughed in the spring, in consequence of the roots of the plants, and the sustenance afforded to the crop by the decay of the rye. Previous to ploughing for the crop, there should be spread about seven two-horse loads of street or horse manure to the acre; but if the soil is poor, more will be necessary, and the ploughing should take place immediately after the spreading. The ground is then harrowed over two or three times, until it is mellow, furrowed shallow, with a plough, into hills four and a half feet asunder, manured with half a shovel full in a hill, which is flattened down with a hoe and covered about an inch thick with fine soil. Short hog manure, carted out of the pen the preceding fall, and cut over early in the spring once or twice, and made fine, is preferred for the hills; but this not being generally sufficiently abundant, we procure the manure of cows which have been fed on distillers' slops, mixed with that of horses, so as to make it sufficiently firm to handle with a fork, from New-York in the fall, which we mix with the hog manure. The manure should be cool, for fermentation in the hills is injurious to the plants.

The sooner the seed is planted after ploughing, the better: the time of planting depends upon the forwardness of the season, and it is generally commenced when single apricot blossoms are open, but some seasons earlier. About a week is occupied in putting in the first seed, and nearly the same period in planting over the first and second times. The casualties to which the seed and plants are subject, induces us to continue putting in seed almost every day for this space of time, so as to make certain work. It sometimes happens, when the weather has been unfavorable, that every hill in some fields is planted over the third, and even single hills the fourth time. I prefer spreading the first seed in the south half of the hills, the first planting over in the northwest, and the second in the northeast quarters: if it becomes necessary to plant over the third time, I put the seed in the south half, where the first seed by that time is rotten. If this plan is properly followed, the different plantings will not interfere with each other. We generally put in from thirty to forty seeds each time, and cover them with fine soil from three-quarters to an inch deep. Sprouting the seed previous to planting does not succeed well early in the season, but does sometimes when the weather is favorable in the latter part. Cucumber seed is the tenderest of the vine kind, for if, after planting at the usual depth, wet weather should follow, it is almost certain to rot; if dry, it dries out; if, when favorable to their vegetating, and the plants have advanced so as to be breaking ground, a storm should occur, they generally perish; a northeaster of three or four days' continuance destroys the plants when young, and in some instan-

ces when more than a week old; if up too early, a late frost is apt to sweep them clean. Seed to vegetate requires to be near the surface of the wet soil, not buried deep into it; our ignorance of the weather which will follow after planting, causes most of our errors; when planted in a heavy soil, it is less liable to rot and dry out than in a sandy one, but the fruit is later. If it happens that there are more plants in a hill than we require, we find it an easy matter to eradicate them with the hoe and fingers, but it is not so easy to place them in the hills when deficient.

When the first rough leaves of the plants are about the size of a twenty-five cent piece, a cultivator is run through the rows both ways, and they receive the first hoeing; the plants are also thinned out, so as not to crowd each other. In hoeing, the soil between the plants should not be disturbed; large weeds, (if any,) be pulled out; fine soil drawn around the plants up to the seed leaves, so as to cover small weeds, and the hill made flat and not concave. We are careful not to hoe while the plants are very young, for if a storm should occur shortly after the operation has been performed, the hills soak in too much water, which is injurious. Ten or twelve days after the first hoeing, the plants (if good,) are thinned to six or eight in a hill, leaving the largest ones, and if possible three or four inches apart. About eighteen days after the first hoeing, or about the time when single blossoms open, we run a one-horse plough twice through a row each way, (if the ground is hard, three times,) throwing the furrow from the hills, and then commence the second hoeing, which is performed in the same manner as the first, care being taken not to earth up higher than the seed leaves, and to scrape out the crust between the plants, if the ground is hard or covered with weeds: they are, also, if the plants are fair, thinned down to five in a hill.

When the vines extend so that single ones meet each other between the hills, to prevent injury, they are carefully laid aside by hand, or with a short stick, and the cultivator for the last time is run once through a row each way. They then receive the third and last hoeing, the ground being loosened and drawn up around the hills with the hoe, and broken between the plants with the fingers. It is customary to leave five plants in a hill, standing from four to five inches apart, but some reduce them to four: have tried no experiment to test which is the best.

Cucumber vines will yield fruit about eight weeks, and the fields are picked over at least every second and sometimes every day. In picking, a light stick with a cross-piece framed to it so as to resemble the letter T, is made use of to push the leaves aside and more readily discover the fruit.

The insects which trouble and destroy the plants, are the black worm and striped bugs: the first is apt to be numerous in ground which was occupied the preceding year with red clover; they cut off the plants at or above the surface in the night, and are generally hunted out early in the morning, when their burrowing is fresh, and they lay near the surface, until the ground is cleared of them: the striped bug or yellow fly eats the plants in the day time, and is sometimes very destructive on land where a crust is formed on the surface, which being raised up by the young plants, affords them a harbor. The best remedy is, with the fingers to catch and destroy them in the morning, when the dew is on them and they are chilled, which prevents their flying and escaping as freely as when the sun has warmed them. Sandy land, having no crust to shelter these pests, is generally exempt from their depredations.

We are acquainted with the system of rotation of crops, and it has been practised among our farmers for years, but cucumbers as well as some other vegetables, do not seem to require it. I have a piece of about half an acre, on which I have cultivated them for the last ten successive years, ploughing in the usual quantity of street manure every second year, and they have flourished as well as on the adjoining ground, which has been similarly manured, and on which the crops have been changed.

The following is the quantity planted, produce and amount of sales, for the last four years, viz.

Year.	Hills planted.	Cucumbers sold.	Am't received.
1835,	6,000,	104,965,	$823 84
1836,	6,600,	99,670,	820 96
1837,	7,370,	130,735,	532 00
1838,	7,110,	118,600,	734 87½

During each of these years, large quantities of cullings, and, when unsaleable, good ones, were fed to the hogs and cattle, of which no account was kept.

Yours, TUNIS G. BERGEN.

Plan of a Garden.

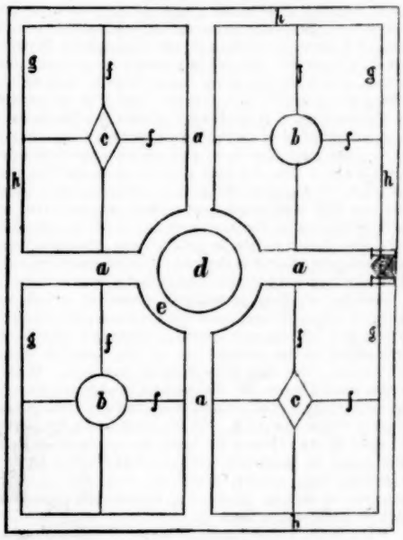
King William county, Va. Oct. 6, 1838.

JUDGE BUEL—Not liking the plan of your garden, as laid down in the last [September] Cultivator, for several reasons, I have sent you a plat of mine, which is at your service, either to be placed before your readers, or thrown under your table, as may seem in your better judgment the most advisable.

It is the usual practice in the south, among moderate estate farmers to combine the flower and vegetable gardens. The desideratum among them, then, is, to lay off a garden which will accomplish the object in the simplest, neatest style. The one in question was laid off this last spring, and has been much admired. It is 60 by 80 yards—nearly an acre. The area is divided by two main walks, eight feet wide, intersected by a circle twenty-four feet in diameter. This, you will perceive, throws the garden into four divisions; each division is divided into four squares by six feet walks, which are again intersected by circles or octagons and diamonds, each twelve feet in diameter. A walk six feet wide runs the circumference of the garden, leaving a border next the paling of four feet. The centre circle is intended for a summer house of lattice work, to be covered with vines, such as the multiflora, &c.—the smaller figures to be devoted exclusively to flora, and decorated and adorned by fixtures, according to the taste of the individuals who may bestow most attention upon them.—There are sixteen squares for vegetables; the borders I shall sow in lucerne or flowers, as is the usual case.

A VIRGINIAN.

[Fig. No. 65.]



REFERENCES.

a a a a Main walks, 8 feet wide.
b b Octagons or circles, 12 feet in diameter.
c c Diamonds, 12 feet in diameter.
d Circle, 24 feet in diameter.
e 6 feet walk around the circle.
f f f f f f f f Walks, 6 feet wide.
g g g g Walk 6 feet, the circumference of the garden.
h h h h Border, 4 feet wide.

The walks round the octagons and diamonds 5 feet wide.

Lunar Influence.

Plymouth, (Conn.) Oct. 29, 1838.

J. BUEL, Esq.—Sir—I have not been much of a star-gazer or moon-gazer, but have often heard it remarked that pork killed in the wane of the moon, would shrink away and waste in cooking. This I have always doubted, although I knew that some years my pork wasted more in cooking than others. This I attributed to some cause other than the influence of the moon, without being able to assign any cause. Last year, I fattened and butchered three hogs, all fattened together, though not all of the same litter. One was killed the first day of December last, weighing 238 lbs. and the other two the 26th of the same month, weighing 328 lbs. and 300 lbs. It will be seen that the first was killed in the new of the moon, and the two last in the old. The pork was salted in the same cask and in the same manner. The pork of the two last killed hogs wasted very much in cooking, either boiling or frying, so that it was noticed by all the family. The cook said, put ever so large a piece of pork in the pot or spider, and it would be very small when fit for the table. But it is entirely different with the pork of the hog first killed. It rather swells than shrinks in cooking. How to account for this difference, I do not know, except from the influence of the moon. The hogs last killed were early March pigs, and the other some older.

It is important to know the cause why meat sometimes wastes so much in cooking; and if the above statement of facts should give any information on the subject, or elicit any, I shall be well paid for my trouble. Very respectfully,

CALVIN BUTLER.

Ice Houses.

In the Cultivator for this month, is an article on the "Construction of Ice Houses." To those about to make them, it is an interesting one; still, it may be desirable to see descriptions of others, that they may have a choice of plans. Four years ago, I had one made, simple, cheap, and it has proved sufficient, thus: Dug a circular hole eight feet deep, the earth thrown out forming a bank of four feet high; the pit thus made, being tunnel shaped, eight feet in diameter at bottom, and thirteen feet at top of the ground; around the sides, placed white pine poles, of about thirteen feet in length, except the space for a door, close to each other, and inverted, without dressing them, save to make them of proper taper. Those of eight to ten inches thick at the buts, were put in whole; those of larger sizes split into halves, and the flat sides put to the bank; they are supported by resting on the bottom and sides of the pit; the buts were sawed to a level, and the earth thrown up on the outside to the upper ends. An octagon roof is formed by eight rafters of four by three, hemlock scantling, twelve feet long, resting on the buts of the poles, and framed into an octagon block at the top; eight intermediate shorter rafters of eight feet long, also resting on the poles in a line with the long ones, supported at top by a cross-piece framed to the adjoining long ones, thus: Used common oak lath, two feet apart, to nail the boards upon; covered with pine boards, tongued and grooved, the angles breaking on the long rafters.

Door upright, four feet wide, five feet high, from ground level, and a cut out of the roof to allow this height. Jambs, to support the bank on each side, made of plank, nailed to posts set in the ground, and flaring to six feet. About forty wagon loads fills my house, where it keeps well. I use straw to about the thickness of a sheaf at the bottom, sides and top of the ice. What ice melts is mostly at the sides; the water is carried off the underside of the poles, and from the shape of the pit, as the ice settles it leaves no vacancy at the sides. At first, I put on a thatched straw roof; it proved a harbor for rats, and in one season they destroyed so much of it, that I had to substitute boards. I have shaded my ice house by an arbor of Isabella Grape vines, which gives us much fruit, and greatly improves the appearance of it, besides breaking the rays of the sun.

ROB'T WHITE, Jun.

Rumson Neck, Shrewsbury, N. J. 10th mo. 1838.

Millers' Tolls Again.

Rahway, Oct. 21, 1838.

Mr. J. BUEL—Dear Sir—On the 16th of October, I had two bushels of wheat, weighing 120 lbs. ground and bolted by Mr. John Florence, at his mills, under my inspection. When I called at the mill, Mr. F. was grinding rye, which he finished, and then put about one peck of corn in to clean the stones. When this was all ground out, he weighed my wheat, and put it in the hopper; the following is the weight of flour and bran, which it made, viz. 118¾ lbs. which deduct from the weight of the grain, leaves a loss of 1¼ lbs. in two bushels, or 120 lbs. of wheat, which of course, will make a loss of 10 oz on one bushel. I do not believe, the average loss in grinding 20, would exceed 7 oz. Now the mystery is, how to account for this loss. I will account for a part of it, in two ways, viz. first, that the dampness of the grain is absorbed by the heat, caused by the friction of grinding, [which dampness, or water, Blair says, is 900 times heavier than air.] Of this fact, any person may convince himself; by putting his hand up into the top part of the leader, that conveys the flour from the stones, he will find it wet, and pasted with damp flour. And in the second place, the flour coming from the stones hot, and perfectly dry, into the damp atmosphere, the finest and dryest of it will rise into the air; there remain until impregnated with its dampness, then settle in every part of the mill. I consider it much more philosophical, to attribute this loss of weight, to the dampness, or water, contained in the grain, than to suppose, as Mr. David Walton has, that it is all fixed air. He appears rather dissatisfied with my requiring the proof for the quantity of air he wishes to make exist in a bushel, or 60 lbs. of wheat, and wants to know, what loose air has to do with the just or unjust tolling of grain? I will reply, that it has nothing to do with the miller's toll; and if he will put a pair of artificial optics astride his nose, and look more attentively at my former communication, he will there see asserted, that if he confined a bushel of loose air in a bushel of grain, it would only add 1 oz. 9 dwt. to its weight: this is the point I am contesting. I wish him to prove that there is more air in any species of grain than the open portions of said grain will contain of loose air. The only way he

can make it appear, is that it is condensed; which I will not admit without plain proof. I say it is confined, if there should any appear in the grain, but do not believe it to be condensed. There might be some probability of air being condensed in grain, provided it grew to the size of a pumpkin, and as hollow, and then diminished until it attained the size of wheat; but as wheat forms in a very small milky substance, and continues to expand until it ripens; I say if it contains air at its formation, it has more room as the grain grows. I apprehend he will be disappointed if he expects to convert nine-tenths of the agricultural community to the belief, that the wheat they raise is even one hundredth part air. It is an established fact in philosophy, that air fills all space that is not occupied by any other matter, and one of its first principles is, that no two things can occupy the same place, at the same time. Now, this wise man has made a discovery that no philosopher has done before him, which is, that all solid bodies contain fixed air. I will quote, for his information, Blair's definition of solidity, viz. "Solidity is that property which every substance possesses, of not permitting any other substance to occupy the same place at the same time." I cannot favor him with the grinding of my wheat, as long as he makes a deduction of from one to five pounds per bushel for fixed air. Yours most respectfully,

WILLIAM A. STONE.

The Combined Effect of Heat and Water on the Temperature of the Atmosphere.

It is a law in the science of heat, "that all bodies, in passing from a rare to a dense state, emit caloric." It is found, also, that when any great change takes place in a body, as its passing from a solid to a liquid, from a liquid to a vapor, or *vice versa*—a great quantity of caloric is either absorbed or emitted, according to its change; whether from a dense to a rare state, or the contrary, which previously remained latent and unappreciable. It is found by experiment, that water, in freezing, gives out 140° of latent heat, and the ice remains at the same temperature immediately after, as the water was immediately before freezing, viz. 32°. Ice in thawing, also, absorbs the same quantity to convert it into a liquid.

The quantity of water, therefore, on the globe, performs a most important office in equalizing its temperature. When the atmosphere is cooled to a temperature below 32°—the freezing point of water—water will begin to freeze, and in freezing, it emits caloric enough for every pound of ice to raise another pound of water 140°, or to make it so hot that we could with difficulty bear our hand in it. Not that it could be made actually to heat a pound of water to this temperature, because its heat could not all be applied to it: but it modifies the temperature of the atmosphere, when below 32°, just as much for every pound of water frozen as a pound of water would do, if heated 172°, and left to cool itself by radiation in the atmosphere, down to the freezing point.

Were it not, therefore, for the vast quantity of water on the earth, we might be scorched by the sultry suns of summer, or fatally chilled by the piercing blasts of winter. Our polar regions during the semi-annual night would be wide wastes of dreary desolation.—Vegetation would be totally destroyed, and all organic life, of whatever description, wholly laid waste. The return of day would bring with it the opposite extreme. The constant rays of the sun would operate without any thing on which to spend their force. As a consequence, the temperature of the earth would be very highly raised—probably above what organized life could possibly bear. As it is, water operates as a check to either excessive heat or cold, by receiving caloric and giving it out as nature requires.

Thus water forms a vast repository, (if I may so speak,) for this most important principle in nature, heat: without which, our globe would be but a mass of totally dead matter. When the sun retires to the southern hemisphere, and the temperature of our climate is reduced by the earth's radiation, so that vegetation is stopped, nature draws on her deposites in our oceans and rivers, by consolidating water to ice, so that the temperature of our atmosphere is prevented from becoming so much below the freezing point of water as it would were there no water, or were that water incapable of being frozen. When again the sun returns to vivify our hemisphere, the same quantity of heat is again returned to the water, by thawing the ice, and thus the deposite is made good.

As summer advances, and the rays of the sun might produce so much heat as to be deleterious to organic life, (as undoubtedly would be the case, were there nothing to counteract it,) water steps in again and undergoes another change. By this, its effects are still greater than in the preceding. In the transformation of water to vapor, about 1000° of heat are absorbed, and that vapor may still be no hotter than the water from which it was formed. That is, a pound of vapor contains about five times as much heat as a pound of water, at its usual temperature in summer, when both are apparently at the same temperature, and the thermometer would be alike affected by each. Evaporation is that process, of which heat is the actuating principle, that keeps up the constant circulation of the waters of the earth—that causes a continual flow of our rivers, which, continually discharging their contents into the ocean, never fill it; and that waters our fields, with refreshing showers to supply the wants of the vegetable and animal kingdoms. In a warm summer's day, vast quantities of water are vaporized. The Mediterranean sea, notwithstanding it receives the waters of numerous large rivers, still receives a constant supply from the main ocean at the straits of Gibralter, to keep up its continual evaporation.

There is no natural phenomenon, if we will study it and trace it to its causes, in which we cannot discover, in some degree, finite as are our powers, the wisdom of the Great Architect of Nature. This property of equalizing the temperature of our atmosphere, is not the only particular, in which this wisdom may be discovered in water. Were it not for its property of containing latent heat, all at once, on the approach of winter, our rivers, lakes and oceans would become so many frozen and solid masses. Not a liquid drop of water could be found when the atmosphere was below 32° Fahrenheit. Again, on the return of spring, these masses of ice would assume their liquidity in as short a time as they were before congealed. Snows from our mountains and hills would, almost instantly, as soon as the atmosphere became warmer than 32°, tumble in torrents from their sides, which would deluge every lower country and sweep every thing within their reach. As it is, when water is freezing, it is done very gradually; for there is a great quantity of heat to be radiated, even after it is so much cooled as to be cold as ice: and when the ice thaws, it has, not only to be heated, so that it is as warm as water is, before it will freeze, but it must receive 140° additional heat which remains latent in, or combined with the water, before it can be liquidated; and then it thaws as gradually as it freezes; and immediately after it is thawed, a thermometer placed in the water will not rise above what it was in the ice.

Another striking property of water, in which important consequences to us are involved, is, its being, when at a certain temperature, expanded by *cold*, in opposition to the general law of heat—water being, (I believe,) the only exception to that law. Water when cooled below 40° Fahrenheit, ceases to contract, in conformity to the general law, and expands as it is cooled below this point. Were it not for *this* property, in spite of its capacity for heat, it is probably that all the water in temperate climates, where we have a tolerable long winter, would be congealed in solid masses, so that all the heat of a summer's sun would not be sufficient to thaw it.

"Ice is the natural state of water;" and with equal propriety we might say, that a solid is the natural state of every substance. Without heat, the great vivifying principle in nature, and as it has been styled "the life and soul of the universe," the most volatile substances would condense to a degree of which we can form no conception. It is perhaps not impossible, extravagant as it may appear, that the hypothesis of Newton, *that our world might be compressed into the compass of a cubic inch*, would be realized by the total absence of heat alone. It is heat that keeps the gases in their gaseous state, that makes water liquid, and keeps our atmosphere from becoming solid, as really as it is heat by which we can reduce the metals to liquids, and make water assume the form of air. Philosophers have never yet been able to produce a substance totally void of heat, and it is reasonable to infer, that they never *can;* so that it is not possible to conceive the effects which *cold*, strictly speaking, would produce.

What the matter, or substance of heat is, does not come within the scope of our inquiry. It is a problem which has never yet been satisfactorily solved. We can study its phenomena and observe its effects; but we must remain, for the present at least, in the dark as to what *heat is*. It is known to possess vast expansive power. Certainly we can no longer question this power, when we are assured that it is the only force which can compete successfully with attraction. It is heat that keeps our globe distended to its present dimensions; and heat that drives our steam-boats and rail-road cars. It is heat that makes such a strong and delightful contrast between the gloomy desolation of winter, and the blithesomeness and verdure of spring and summer. It is heat by which we are enabled to overcome the strong cohesive attraction in the metals, and reduce them to liquids and dispel them in vapor. And, indeed, it is probable that, by a sufficient quantity of heat, every substance, even the most dense in nature, might be made to undergo the same successive changes which would result in their conversion into "thin air."

From the foregoing we learn the following facts for practical application.

1. The man who burns green wood, does it at a great loss. For, as green wood contains about one-third its weight of sap and water, enough heat must be employed to convert these liquids into steam and dispel them. Now all steam contains about 1000° heat, which is not sensible, and consequently cannot be of any use in warming the apartment.

2. The man who would heat his water hotter, after it boils in an open vessel, is foolishly wasting fuel. For all surplus heat, over enough to make it boil, is rendered latent in the vapor which is dispelled.

3. We learn also, why those towns adjacent to the sea and islands possess a greater uniformity of temperature than those places farther inland, and more remote from any large collection of water.

4. The above theory is practically acted upon, when gardeners, (as they sometimes do,) to preserve fruit trees from the effects of frost, connect them with straw ropes, having their ends immersed in a tub of water: and also by sprinkling vegetables with water in the evening, when there is a prospect of frost.

5. Substances which freeze at a temperature below 32°, as potatoes, apples, &c. may be prevented from freezing, by keeping them with water near them, in a confined situation. As long as any water remains uncongealed, such substances are safe. P.

Albany, Nov. 1838.

Remedy for Sprains, Bruises, &c.

As it frequently happens that severe swellings occur from bruises, sprains, &c., I take the liberty of sending you a recipe which has, in various instances within my own sphere of observation, produced the most rapid and extraordinary relief. It was tried a few days ago, upon the foot of a gentleman who was suffering agony from a violent sprain and afforded instantaneous relief. I have used it with great success in dispelling fistulous swellings upon horses. It has never with me failed to reduce the swelling, unless pus had formed. Its simplicity has caused it to be rejected by some, but as it can do no harm, and as the materials are at hand, it can at least be tried. It is a mixture of one pint of soft soap; a pint of good vinegar; a handful of common salt, and a table spoonful of powdered nitre; put them into a common white basin and bathe the part affected. I have never used it where the skin is abraded, as most probably violent pain would ensue. If, upon trial, you deem it worthy of publication, I shall be pleased to see it in the pages of the widely circulating Cultivator.

T. F. NELSON.

Virginia, Oct. 26, 1838.

A Looking-Glass.

J. BUEL, Esq.—Dear Sir—When I was a boy, I can well remember how I used to be induced to wash my smutty face, by having a looking-glass held before my eyes. For the same purpose, I have extracted the following picture of "a farmer," from the writings of that most eccentric and excellent writer, "Samuel Slick," in the hopes that if any of your readers should happen to see any part of himself therein, that he will improve by the view. Here it is.

"* * * That critter, when he built that wrack of a house, (they call 'em a half house here,) intended to add as much more to it some of these days, and accordingly put his chimbley outside, to sarve the new part as well as the old. He has been too "busy" ever since, you see, to remove the banking put there the first fall, to keep the frost out of the cellar, and consequently it has rotted the sills off, and the house has fell away from the chimbley, and he has had to prop it up with that great stick of timber, to keep it from coming down on its knees altogether. All the winders are boarded up, but one, and that might as well be, for little light can penetrate them old hats and red flannel petticoats. Look at the barn; its broken back roof has let the gable eends fall in, where they stand staring at each other, as if they would like to come closer together (and no doubt they soon will,) to consult what was best to be done to gain their *standing* in the world. Now look at the stock; there's your "improved short horns." Them dirty looking, half starved geese, and them draggle-tailed fowls that are so poor the foxes would be ashamed to steal them—that little lantern jawed, long leg'd, rabbit ear'd runt of a pig, that's so weak it cant curl its tail up—that old cow frame standing there with her eyes shut, and looking for all the world as tho' she's contemplating her latter eend—(and with good reason too,) and that other reddish yellow, long wooled varmint, with his hocks higher than his belly, that looks as if he had come to her funeral, and which by way of distinction, his owner calls a horse—is all "the stock," I guess, that this *farmer* supports upon a hundred acres of as good natural soil as ever laid out doors.—Now there's a specimen of "Native Stock." I reckoon he'l imigrate to a warmer climate soon, for you see while he was waiting to finish that thing you see the hen's roosting on, that he calls a sled, he's had to burn up all the fence round the house, but there's

no danger of cattle breaking into his fields, and his old muley has larnt how to sneak round among the neighbors fields o' nights, looking for an open gate or bars, to snatch a mouthful now and then. For if you was to mow that meadow with a razor and rake it with a fine tooth comb, you could'nt get enough to winter a grasshopper. 'Spose we drive up to the door and have a word of chat with Nick Bradshaw, and see if he is as promising as outside appearances indicate.

Observing us from the only light of glass remaining in the window, Nick *lifted the door* and laying it aside, emerged from his kitchen parlor and smoke house, to reconnoitre. He was a tall, well built, athletic man, of great personal strength and surprising activity, who looked like a careless good natured fellow, fond of talking, and from the appearance of the little old black pipe which stuck in one corner of his mouth, equally so of smoking; and as he appeared to fancy us to be candidates, no doubt he was already enjoying in prospective the comforts of a neighboring tap room. Jist look at em—Happy critter—his hat crown has lost the top out, and the rim hangs like the bail of a bucket. His trowsers and jacket show clearly that he has had clothes of other colours in other days. The untan'd mocasin on one foot, which contrasts with the old shoe on the other, shows him a friend to domestic manufactures; and his beard is no bad match for the wooly horse yonder. See the waggish independent sort of a look the critter has, with his hat one side and hands in his breeches pockets, contemplating the beauties of his farm. You may talk about patience and fortitude, philosophy and christian resignation, and all that sort of thing till your tired, but—ah, here he comes. 'Morning Mr. Bradshaw—how's all home to day? Right comfortable, (mark that—comfort in such a place,) I give thanks—come, light and come in. I'm sorry can't feed your hoss—but the fact is, tan't bin no use to try to raise no crops, late years, for body don't git half paid for their labor, these hard times. I raised a nice bunch of potatoes last year, and as I could'nt get nothing worth while for 'em in the fall, I tho't I'de keep 'em till spring. But as frost set in, while I was down town 'lection time, the boys did'nt fix up the old cellar door, and this infarnal cold winter froze 'em all. It's them what you smell now, and I've just been telling the old woman that we must turn too and carry them out of the cellar, 'fore long they'll make some of us sick like enough—for there's no telling what may happen to a body late years. And if the next legislator don't do something for us, the Lord knows but the whole country will starve, for it seems as tho' the land now a days won't raise nothing. It's actually *run out*. Why, I should think by the look of things round your neighbor Horton's, that his land produced pretty well. Why, yes—and it's a miricle too, how he gets it—for every body round here said, when he took up that tract, it was the poorest in the town.—There are some folks that thinks he has dealings with the "black art," for't does seem as tho' the more he work'd his land, the better it got.

Now, here was a mystery—but an easy explanation of Mr. Slick soon solved the matter, at least to my mind. The fact is, says Mr. Slick, a great deal of this country is *run out*. And if it warnt for the lime, marsh-mud, sea weed, salt sand, and what not, they've got here in such quantities, and a few Horton's to apply it, the whole country would *run out* and dwindle away to just such great, good natured, good-for-nothing, do-nothing fellows as this Nick Bradshaw, and his wooly horse, and wooless sheep, and cropless farm, and comfortless house, if indeed such a great wind rack of loose lumber, is worthy the name of a house.

Now, by way of contrast to all this, do you see that neat little cottage looking house on yonder hummock, away to the right there, where you see those beautiful shade trees. The house is small, but it is a *whole* house. That's what I call about right—flanked on both sides by an orchard of best grafted fruit—a tidy flower garden in front, that the galls see to, and a most grand sarce garden jist over there, where it takes the wash of the buildings, nicely sheltered by that bunch of shrubbery. Then see them everlasting big barns—and by gosh, there goes fourteen dairy cows—as sleek as moles. Them flowers, honeysuckles and rose bushes, shows what sort of a family lives there, jist as plain as straws show which way the wind blows.

Them galls, an't 'tarnally racing round to quiltin and husking frolics, their feet exposed in thin slips to the mud, and their honor to a thinner protection. No, no—take my word for 't—when you see galls busy about such things to home, they are what our old minister used to call "right minded." Such things keep them busy, and when folks are busy about their own business, they've no time to get into mischief.—It keeps them healthy, too, and as cheerful as larks. I've a mind w'll 'light here, and view this citizen's improvements, and we shall be welcomed to a neat substantial breakfast, that would be worthy to be taken as a pattern by any farmer's wife in America.

We were met at the door by Mr. Horton who greeted my friend Slick with the warm salutation of an old acquaintance, and expressed the satisfaction natural to one habitually hospitable, for the honor of my visit. He was a plain, healthy, intelligent looking man, about fifty, dressed as a farmer should be, with the stamp of "HOMESPUN," legible upon every garment, not forgetting a very handsome silk handkerchief, the work throughout of his oldest daughter. The room into which we were ushered, bore the same stamp of neatness and comfort that the outside appearance indicated. A substantial homemade carpet covered the floor, and a well filled book-case and writing desk, were in the right place, among the contents of which, I observed several Agricultural periodicals. I was particularly struck with the scrupulously neat and appropriate attire of the wife and two intelligent, interesting daughters, that were busily engaged in the morning operations of the dairy. After partaking of an excellent substantial breakfast, Mr. Horton invited us to walk over his farm, which, tho' small, was every part in such a fine state of cultivation, that he did not even express a fear of "starving, unless the legislature did something, to keep the land from running out."

We bade adieu to this happy family, and proceeded on our journey fully impressed with the contrast between a good and bad farmer, and for my own part, perfectly satisfied with the manner that Mr. Slick had taken to impress it indelibly upon my own mind.

Mr. Slick seemed wrapped in contemplation of the scenes of the morning for a long time. At length he broke forth in one of his happy strains. "The bane of this country, 'Squire, and indeed of all America, is having TOO MUCH LAND—they *run over* more ground than they can cultivate—and crop the land year after year, without manure, till it is no wonder that "*it's run out.*" A very large portion of land in America has been "run out," by repeated grain crops, and bad husbandry, until a great portion of this great country is in a fair way to be ruined. The two Carolinas and Varginny are covered with places that are "run out," and are given up as ruined, and there are a plagey site too many such places all over New-England, and a great many other states. We hav'nt the surplus of wheat that we used to have, in the United States, and it'll never be so plenty while there are so many Nick Bradshaw's in the country.

The fact is, 'Squire, edecation is ducedly neglected. True, we have a site of schools and colleges, but they an't the right kind. That same Nick Bradshaw has been clean through one on 'em, and 'twas there that he larnt that infarnal lazy habit of drinking and smoking, that has been the ruin of him ever since. I would'nt give an old fashioned swing tail clock, to have my son go to college where he could'nt work enough to arn his own living, and larn how to work it right tu.

It actilly frightens me, when I think how the land is worked and skinned, till they take the gizard out on't, when it might be growing better every day.—Thousands of acres every year are turned into barrens, while an everlastin stream of our folks are streaking it off "to the new country," where about half on 'em after wading about among the tadpoles, to catch cat fish enough to live on a year or two, actilly shake themselves to death with that everlasting cuss of all new countrys, the fever and agur. It's a melancholly fact, 'Squire, tho' our people don't seem to be sensible of it, and you nor I may not live to see it, but if this awful robbin' of posterity goes on for another hundred years, as it has for the last, among the farmers, we'll be a nation of paupers. Talk about the legislature doing something, I'll tell you what I'd have them do. Paint a great parcel of guide boards, and nail 'em up over every legislature, church, and school-house door in America, with these words on em in great letters. "THE BEST LAND IN AMERICA, BY CONSTANT CROPPING, WITHOUT MANURE, WILL RUN OUT." And I'd have 'em, also, provide means to larn every child how to read it, cause it's no use to try to larn the old ones—they're tu sot in their ways.—They are on the constant stretch with the land they have, and all the time trying to git more, without improving any on't. Yes, yes, yes, *too much land* is the ruin of us all.

Although you will find a thousand more good things among the writings of "The Clockmaker," I hope you will not look for a *literal* copy of the foregoing. And if ever this meets the eye of the writer of the "Sayings and doings of Samuel Slick," I beg him to excuse me for the liberty I have taken with his own language. I remain your agricultural friend,

SOLON ROBINSON.

Lake C. H. Ia. Oct. 12, 1838.

Experiment in Planting Potatoes.

EDITOR CULTIVATOR.—Dear Sir—I have made a small experiment on potatoes this season, that may be useful. I selected a bushel of very small ones, and planted them in seven drilled rows, eleven rods long, the ground in fine order, ridged, and well cultivated during the growth.

Another bushel of largest size, I planted, one half in one row, whole, along side of the others, then cut the other half into three or four pieces each, and planted in two rows; the land and cultivation all the same.

The extreme drought that we have suffered, renders it unnecessary to speak of the amount of the yield, except comparatively.

The two rows of cut seed produced three baskets full—the one row of uncut produced two and a half baskets full, and the seven rows of small seed produced fourteen baskets full. But mark, like the seed, was the crop. The vines of the small seed were ever small spindling vines, and the tubers were likewise.—The vines of the uncut showed the rankest growth, but the difference in the general size of the tubers in the cut or uncut rows, was not much in favor of the uncut. Call the basket a bushel, and the result is easier stated. One bushel of small seed, produced fourteen bushels of small potatoes—half a bushel of large seed, planted upon one-seventh quantity of ground, produced two an half bushels of large ones—and half a bushel of large seed, cut, planted upon two-sevenths of the quantity of ground, produced three bushels of large ones.

The seed, when I planted it, was worth 75 cents a bushel—the crop, when dug, was worth 37½ to 50 cents a bushel—the cost of seed in each row of small seed, 10½ cents—the worth of the product 75—just seven fold in money and 14 in measure. The cost of the uncut seed 37½ cents to one row—the worth of the product $1.25, being worth 12½ cents more per bushel than the small ones, making three and one-third fold in money, and five in measure. The cut seed cost 18¾ cents to the row, and the product worth 75 cents, making four fold in money, and six-fold in measure.

If the experiment is a fair criterion to base an opinion upon, the result shows to my mind, the following data.

If seed is high, ground plenty, and the crop wanted for stock, plant small seed.

If seed is plenty, ground scarce, and the crop wanted for family use, and future seed, plant large seed, without cutting.

If seed is scarce, ground plenty, and the crop wanted for family use, and future seed, plant large seed, and cut them. Am I right in my conclusions?

These rows as above stated, 11 rods long, are at the rate of 78 to the acre, 3 feet apart. The large uncut potatoes were planted at the rate of 39 bushels to the acre; the product 195. The large cut, were planted at the rate of 19½ bushels to the acre; the product 117. The small ones were planted at the rate of 11 bushels to the acre; the product 156. For my own part, I shall in future plant large potatoes whole. I should like yours, and your correspondents' opinions and experiments. Your friend,

SOLON ROBINSON.

Lake C. H. Ia. Oct. 15, 1838.

REMARKS.—The Conductor will at present only remark, that the choice between cut and uncut potatoes, should depend somewhat, he thinks, upon the kind of potato planted. Some kinds, having but few eyes, may advantageously be planted whole; while other kinds, having many eyes, as the Rohan, forty-fold, &c. are best planted in sets, or pieces. We have counted 47 eyes in a Rohan, all of which it is presumed, would grow, and give 47 stalks to a hill. It will at once be perceived, that instead of producing in size like the seed, the progeny must necessarily be small, both for want of food and want of room. In this case, we venture to say, if the tuber was cut into 20 sets, and each planted separate, the value of the product would be twenty fold greater than if the whole potato was planted in a single hill. We have chosen this strong case, the better to illustrate the distinction we would make. Small seed almost invariably produces small stalks, and small stalks are a pretty sure indication of small tubers.

EXTRACTS.

Science of Gardening.—*Continued.*

[*From the Alphabet of Gardening.*]

It does not appear to me to be at all necessary for understanding the scientific principles of gardening, to go minutely into all the points respecting the interior structure of plants, and the functions attributed to the several tissues, and vessels, inasmuch as those best skilled in such inquires are by no means agreed upon many particulars. The attention will therefore be more usefully directed to the points which have been best ascertained and least disputed.

RISE OF THE SAP.

The fluids taken up from the soil by the spongelets at the tips of the root fibres, are carried up into the main root in a manner not yet well understood, whether it be by minute tubes, or by oozing among

the cells, as water is diffused through blotting paper or lump sugar. These fluids, as soon as they enter a plant, whatever may be the manner in which this is effected, take the name of sap, the rise of which into the stem is demonstrated by the ingenious experiment of watering with very thin coloured fluids, some of which are taken up, though the ordinary sap is for the most part without colour, and transparent like water. The yellow juice of celandine, and the milky juice of spurge are not sap.

In animals, the nutritive portion of the digested food which is taken up, as we have already seen, on the inner surface of the intestines, by the mouths of innumerable small tubes, is thence carried by the union of these into one* of considerable size, which conveys the whole into a vein,† where it is mixed with the blood. It is thence carried to the heart, by whose motion or beating it is thrown into a large vein,‡ and carried to the lungs, where it is distributed into innumerable small tubes and exposed through their very thin membranes to the fresh air taken in by breathing. Here the blood takes from the air a portion of its oxygen, and at the same time parts with a quantity of carbonic acid gas, which is carried off by the returning breath: hence deteriorated by the loss of oxygen, and by having become loaded with carbonic acid. It is this deterioration, which renders it indispensable for all animals to breathe fresh air, as confined air is soon rendered poisonous and becomes fatal. The blood thus freed from superabundant carbonic acid, and united with a portion of oxygen, is collected by innumerable minute arteries which unite into one,§ and carry it back to the heart, to be thence distributed to every part of the body, for the purpose of supplying fresh materials for the growth or repair of the several parts.

These things I have stated more at length, in order to point out the very different processes that take place in plants, which have nothing like the animal heart to impel the sap into circulation, for the pith in the centre of trees, though popularly termed the *heart*, performs no such office.

USE OF LEAVES.

The leaves, however, have been proved, by numerous experiments, to be in some respects similar in their functions to the lungs of animals, though very unlike if considered as organs. The sap, for instance, is spread out in a leaf, into small portions, as is the blood in the animal lungs; and for the similar purpose of exposing it to the action of the air.

It is important to remark that the air acts on the blood in the animal lungs always in the dark, whereas in acting upon the leaves of plants, it is by turns in the dark, and by turns in the light—and the results under these two circumstances are very different.

In the dark, leaves, like the lungs of animals, take in oxygen from the air and part with a portion of the carbonic acid gas contained in the sap; from which it is evident that they obtain a greater portion of this important material than is supplied by the water or the atmospheric air mixed with it, taken in by the roots from the soil.

It follows, that the air of a green-house, or any room or confined place where plants are kept, must be unwholesome during the night, from the air in such cases being deprived of its oxygen, and also loaded with carbonic acid gas. Consequently, flowers ought not to be kept at night in bed-rooms, though during sun-light they purify the air.

In the light, the sap which is spread over the upper surface of a leaf immediately under the thin, colourless, and transparent skin,‖ parts with a portion of its water in the form of vapor, and also with the oxygen contained in the carbonic acid gas, (which is composed of oxygen and carbon,) and as the oxygen goes off the carbon remains, while the sap, previously little less fluid than water, is converted into a sort of pulp,¶ a considerable proportion of which consists of carbon. The use of this pulp, as we shall see anon, is, like the animal blood, to supply fresh materials, for the growth of the plant; and as the blood, after it has been acted on by the air in the lungs, passes from the veins to the arteries, so the pulp of plants is plausibly conjectured, but not proved, to pass from the upper to the under side of the leaf. The tubes or cells in which this pulp is lodged being of a yellow colour, and the carbon, according to Sennebier, of a dark blue, produce between them the green colour of the leaves and the younger bark, and hence the darkness of the green becomes a sort of test to determine the quantity of carbon separated from the sap, and also in some measure of tenderness and strength; plants being usually vigorous, hardy and tough, in proportion to their carbon, or, if Sennebier is right, in proportion to the darkness of their green. The term vigorous appears to be misapplied to plants of a pale colour, which grow too large and become dropsical.

It is, at all events, certain, that blanched plants are tender; that bulbs placed so deep as to blanch a large portion of their leaves before reaching the surface, are too weak, as I have experienced, to flower well; and that young leaves in the spring, before they acquire their full green, are readily injured by frosts and cold winds.

In accordance with these views, it may be stated that plants are of darker green in Italy, where the sun is seldomer overclouded, than in England; and though the grass has certainly a good colour in "green Erin," it is not, I think, to be compared with the beautiful green meadows in the Canton of Berne in Switzerland, where the sun-light is more intense from the general elevation of the country. In American forests, when the young spring leaves appear, they sometimes continue pale yellow for several weeks, from the haziness of the sky, but no sooner does the haze clear away, and the sun shine out, than the green deepens almost visibly. "The colour of the forest," says an eye-witness, "absolutely changed so fast, that we could perceive its progress; by the middle of the afternoon, the whole of these extensive forests, many miles in length, presented their usual summer dress."

It is a very curious fact connected with this subject, that, as it is on the upper surface of the leaf only where the sap is changed into pulp by the action of air and light, the leaf cannot be reversed, so as to place its upper surface undermost, and away from the direct light of the sky, without injury. When Bonnet accordingly placed leaves with their upper surfaces upon water, they withered almost as rapidly as in dry air.

Some practical gardeners, such as Lyon and Hayward, are disposed to question this circulation of the sap, but it has been proved beyond all doubt by experiment. Dr. Darwin plunged plants of spurge in water tinged red, and saw it rise through the leaf-stalk, and after being decomposed by the air and light, saw it return white from the edges of the leaf. T. A. Knight traced the returning pulp back into the leaf-stalk, and thence into the inner bark. He found also that if the leaves be stript from the upper part of a branch, the bark will wither as far as it is stript; and if a ring of the bark be cut out above and below a leaf, the wood in the part above the leaf does not grow.

It is therefore fair to conclude, that all the increase in growth arises from the leaves, that is from the pulp, prepared in the leaves by light and air, in the same way as all the increase in the growth of animals arises from the blood prepared in the lungs by the air, without light.

The doctrine held in some recent works of high pretensions, that the water given off by a plant is not produced "exclusively by the action of light and air," but "is *due** to evaporation, or prespiration," which sometimes causes water equal in weight to that of the plant to be perspired in twenty-four hours, is quite erroneous. It is altogether owing to light or air.

The high importance of the leaves becomes thus manifest, and nothing will more enfeeble a plant than taking off its leaves in the growing season; though they are no longer necessary during the cessation of growth in the winter. Their fall previous to winter is not caused by cold; for some trees drop their leaves while the weather is comparatively warm, but in consequence of the vessels at the root of the leaf-stalk becoming gradually rigid and obstructed, so as to prevent the rise of the sap, or, at least, the return of the pulp. When a branch is in any way killed during the summer, its leaves do not fall, so that the killing of a leaf will not make it fall.

The slower growth of evergreens, and the difference of their pulp, as well as of the texture of their skin, render their leaves less subject to a general fall, which takes place only partially and by degrees. It is probably on account of the skin of the leaves becoming thicker and firmer from exposure to brighter sunshine, that our oak and other similar trees become evergreens in warm climates, as St. Helena.

DESCENT OF THE PULP.

That the pulp formed from the sap in the leaf, passes back through the leaf-stalk into the bark, has just been proved; but the best inquirers are not agreed upon the manner in which it is afterwards distributed so as to nourish all parts of the plant. It is sufficient to know the unquestionable fact that it does so. A portion of it certainly passes down through the bark to the very root, where it in all probability throws out, as would appear from the experiments of Brugmans and Mirbel, such refuse materials as could not be used, and something of this kind may be seen adhereing to the root fibres of hyacinths growing in water-glasses.

A portion of it, in its descent, must also pass off into the stem, probably, by what may be termed pulp-cells, or by rays or plates, popularly termed the silver grain.* The pulp-cells have been supposed to be designed as reservoirs for spare nutrient matter, somewhat like the fat of animals, which is similarly stored up.

SEASONS OF GROWTH AND ITS CESSATION.

Too little attention has been paid in books of science to the different circumstances of plants, during the several seasons of the year; and not a few errors have thence been the consequence. It is commonly stated, for example, that "the sap rises in spring and descends again in autumn," whereas we have seen that the sap does not descend at all, at least in the state of sap, and it is very clear that in proportion as the pulp-vessels in the leaf-stalks become obstructed with woody or carbonaceous matter towards the autumn, a circumstance indicated by the leaves becoming tinged with yellow, the quantity of descending pulp must be diminished, and the rise of the sap, from the same cause, must be interrupted.

The facts then, so far as at present ascertained, appear to be, that, from this obstruction in the sap and pulp-vessels of the leaf-stalk, the sap rises in gradually diminished quantities, till, at length, when the leaves fall, it almost ceases. I say "almost," for that it does not altogether cease to rise is proved by the buds and bark continuing alive and fresh, though they would infallibly wither and die, if the supply of sap, admitted to be very small, but indispensable to their healthy state, were cut off by removing the roots.

Certain animals which cease to eat on the setting in of winter, such as the squirrel, the bat, the snake, the frog, the snail, and numerous species of insects, continue to live in a sluggish and nearly motionless, state, very different from sleep, in the circumstances, particularly, of the very slow and scarcely observable circulation of the blood, and of breathing, whose rapidity is not very greatly affected during ordinary sleep.

The terms *dormancy* and *dormant*, therefore, are inaccurate, when applied to this state, which is better designated by torpidity and torpid. Such animals are found previous to winter to become unusually fat, as indeed is the case, at this season, with most other animals, owing in part to the loss of substance becoming less, as perspiration diminishes with the increase of the cold.

Now plants, in winter, seem to be in circumstances very similar to those of torpid animals, the circulation of the sap, like that of the blood, and the changes effected by air and light, like the process of breathing, being scarcely, if at all, observable. With respect also to the increase of fat, it is said by T. A. Knight, De Candolle, and others, that a larger proportion than usual of nutrient pulp accumulates in the root, and in the pulp-wood.† That this is the case with the buds of trees, with the bulbs of bulbous plants, and with the crown‡ of the root of most perennial plants, and with the tubers of potatoes and dahlias, I think there can be no question.

In this state of torpidity, then, the greater number of plants continue during the winter; but the torpidity is more or less in degree according to the mildness or severity of the weather. I gathered a wild rose,§ fully blown, in Musselburgh Haugh, in Dec. 1818; and if the branch of a vine whose root is planted in the open air, be introduced in winter into a green-house, it will push out leaves, while the branches without remain torpid. That it does not derive its nourishment from the air of the green-house, was proved by De Candolle, who found that the roots of a vine thus forced into leaf, exhausted the water of a bottle in which he placed them, while those of an adjacent vine not thus forced into leaf, took up very little, if any, water from a bottle.

As animals, revived from their winter torpidity by unusually warm weather, are more apt to be injured by the recurrence of severe cold than if they had continued torpid, a circumstance but too frequently witnessed in the case of hive-bees, so plants prematurely roused from their natural winter torpidity by warmth, to expand their buds, are almost certain to suffer by it, should severe weather afterwards ensue.

It is important to remark here, that, like the leaves, the smaller root fibres shrivel and fall off, or become detached from the main root, a circumstance, which has not hitherto received the attention which it well merits, both in a scientific and in a practical point of view. The fact is very obvious in the potato, the ranunculis and anemone, the dahlia, the carmyle,‖ and in all bulbs.

"The soil," says De Candolle, "is warmer than the air at mid winter;" (being always about eight degrees above freezing;) "this warmth rouses into life the trunks and roots then full of the nutrient pulp

* Technically, *Thoracic Duct.*
† Technically, *Subclavian Vein.*
‡ Technically, *Pulmonary Vein.*
§ Technically, *Pulmonary Artery.*
‖ Technically, *Cuticle*; in Latin, *Cuticula.*
¶ In Latin, *Cambium*, formerly *Parenchyma.*

* *Due*, Anglo-French for "owing,"

* In Latin, *Radii* or *Laminæ medullares.*
† In Latin, *Alburnum*,
‡ In Latin, *Corona*, or *Torqua.*
§ In Latin, *Rosa spinosissima.*
‖ In Latin, *Orobus tuberosus.*

collected in the preceding summer; while, from this cause, new root fibres shoot out towards the end of winter. These, having all the freshness and activity of youth, display their energy by pumping up the moisture from the soil. The awakening of vegetation then arises from two causes,—the activity of the new root fibres which push the sap they have taken in onwards from behind; and the activity of the bark which draws it upwards. When it arrives at the leaf-buds it causes them to expand; but acts first on those at the summit of the branches, either because it can rise more easily in a perpendicular direction, or rather because the wood and bark of the upper branches is younger, and therefore more energetic."

That these are not the only causes, it is proved by plants often expanding their buds in spring, when the cold is greater than in autumn, and bulbs and the tubers of the potato cannot be kept from shooting except in considerable cold. It may therefore be inferred that plants are endowed with, or acquire periodical tendencies, in the same way as we ourselves go to sleep and waken again at the periods to which we have become accustomed. This is farther proved by plants taken to climates differing from those where they have been produced. English apple trees, for example, when first taken to Canada, bloomed much too early, and had all their blossoms nipt with the spring frosts, till, after being inured to the climate they learned to bloom later; which our almond trees in England, brought from the warm banks of the Jordan, have never yet sufficiently learned, and hence those fine trees, whose spring blossoms are so delightful, are rarely fruitful.

Bulbs become torpid about the close of spring, and re-awaken into life in the autumn, continuing to grow during the winter.

It is worth remarking, that when the buds of a plant have been once awakened into expansion, and new root fibres have begun to form, they will go on even at a lower heat than would have served to rouse them at first, as was experimentally proved by Mirbel and Chevreul.

It is evident from the preceding facts and inferences, that the strength which a plant will show in the spring, and consequently its successful growth in the succeeding summer, will depend much on the store of nutrient matter which it has been able to prepare and store up, in the buds, the pulp-wood, the root, and more particularly in the crown of the root; an important consideration in pruning and forcing, as well as in most of the processes of gardening.

The Offices of Roots and Leaves.

[*From Madden's Chemical Reports.*]

Plants may be said to consist of two great parts, the root and the stem, with their various appendages. But since we are in this place merely to consider one function of vegetable life, namely, the function of *absorption*, or the manner in which plants bring matter, external to themselves, within the range of their vital actions, we may confine our researches almost entirely to the *roots* and *leaves*,—these being beyond doubt, the parts by which extraneous matter is first received into the plant; and, in the first place, let us examine the functions of the root.

The term *root* is generally considered to include all that part of the plant which is beneath the surface of the soil. This, however, is not strictly correct; for many plants possess what botanists call a *rhizoma*, or underground stem. The true root is that part of the plant which, from the instant of its bursting the coverings of the seed, begins to direct its course downwards (or towards the earth's axis,) "with a tendency so powerful, that no known force is sufficient to overcome it." Moreover, it differs from the stem in many of its characters; thus, it does not divide itself into smaller fibres in the regular manner, in which stems generally give off their branches. Again, it never produces leaves or scales; and another important distinction is, "that it never becomes green (at least in tissue) when exposed to the action of air and light, while all the other parts of vegetables, when thus exposed, assume that colour." The root is divided into the body and fibres, the latter of which will alone claim our attention. These fibres are furnished at their extremities with a remarkable structure, which, from its resemblance to a sponge, has been termed *spongiole*. It consists of an extremely loose texture, and is most probably merely "the newly formed" internal "tissue" of the root itself, deprived of its more dense covering, or *cuticle*, as it is termed. This opinion is very much strengthened by the well-established fact, that roots grow by their extremities only. In this manner the spongiole is always being renewed; and, what is of still more consequence, is never *long in one place*. On this account it is that plants which live many years (if not growing too near others of the same kind) are not liable to die from having exhausted the soil; or, in other words, are not liable to be starved to death; for it is evident that, by the constant *change of position* of the spongiole, which is the only part of the root by which nourishment is received into the plant, there must be a constant supply of food, so long as the soil around it contains any organic matter in a fit state for absorption. It has been shown, by innumerable experiments, that the spongioles, or absorbent extremities of the roots, cannot take up any thing but fluids; or, at all events, if they can absorb solids, they must be in such a minute state of division, that they would remain suspended in water, even for a considerable time, which is a fineness of particles far greater than will probably ever be attained by any *mechanical* means.

It has likewise been proved, that plants are capable of choosing to a *certain* degree, their food; or, in other words, of selecting those substances which are best adapted for their peculiar nature, and rejecting what would be injurious. This power, however, appears to be limited, as it is perfectly possible to destroy a plant by giving it poison by the roots. The root, moreover, has the power of *excretion*, or returning to the earth such matters as are either useless or injurious. From this last property of roots, we may draw two valuable conclusions; *first*, That in order to poison a plant, the substance used must be capable of acting rapidly, or it will most probably be rejected before it has had time to produce its effect; and *secondly*, that since plants reject substances *useless* and *injurious* to them, the soil where they grow may in time become so impregnated with such substances as to render it incapable of supporting the *same species* of plant any longer; or at least until such time as the rejected matter shall have been decomposed. This point will be enlarged upon when we come to treat of the rotation of crops. The next purpose which the roots of all land, and the majority of aquatic plants, serve, is obviously to fix it firmly in its place. On this account, we find, in *many cases*, that a certain proportion exists between the size of the stem and the root. This, however, is subject to exceptions. But, on the other hand, in all cases an obvious relation may be perceived between the *form* of the root and the kind of soil in which the plant grows. Thus, if two specimens of the same plant—some of the grasses, for example—be found growing, the one in clayey, the other in a sandy soil, it will be seen, on examination, that the root of the one growing in the sand is much more minutely subdivided, and contains many more small fibres, than the one which grew in clay; and the reason of this is obvious: We have already seen that the spongioles are the only absorbent parts of the root; that they exist only at the extremites of the smallest fibres; and, moreover, that they can take up nothing but what is presented to them in the form of solution.—Now, in the clayey soil, from its retentive nature, the soluble parts are not allowed to drain away; and hence the plant is supplied with food near at hand, and, consequently, a few short fibres are sufficient. On the other hand, plants growing in sand are frequently deprived of all fluid near them, by the sinking of the soluble matters through the loosely aggregated soil; in which case the plant would inevitably perish from starvation, were it not for the wise law of Nature, which provides against such calamities, by endowing the roots of plants, placed under such circumstances, with the power of shooting forth innumerable minute fibres in all directions, in order that advantage may be taken of every drop of moisture which falls in their neighborhood. Nor is it merely in the number of minute fibres that the roots of plants growing in sand differ from those which inhabit the stiffer soils. The form of the *body* of the root is distinct; thus, nearly all bulbous, and other large succulent roots—as the turnip, for example—require sandy soil; and moreover, some plants—as that species of grass named *Phleum pratense*, (meadow cat's tail, or timothy-grass)—change the form of the root, according to the soil they inhabit; thus, in stiff clays, the plant just mentioned has a fibrous root, whereas in sand it becomes bulbous, and assumes all the characters of *Phleum nodosum*. The explanation here is as evident as in the former case. The bulbs of the roots act as reservoirs of food for the plant; thus, in very dry seasons, these bulbs shrivel up, their fluids being all needed by the rest of the plant and hence withdrawn. So beautifully do we perceive in this, as in all other cases, that design and adaptation of means to specific purposes, which must impress even the most sceptical with the absolute existence of a *Great First Cause*. So much for the root and its functions.

Important and complicated as these may appear, the leaf performs offices of a much more obscure nature. In the words of the justly celebrated Lindley, "Leaves are at once organs and respiration, digestion, and nutrition. They elaborate the crude sap impelled into them from the stem, parting with its water, adding to it *carbon*, and exposing the whole to the action of air." To describe fully in this place these numerous operations, would not only occupy far too much space, but would, to a certain degree, be foreign to our subject, as all we wish to examine at present is, how the nutritious matter gets into the plant, putting completely out of the sight the question as to what becomes of it after it is absorbed. From the sentence above quoted, we find that *carbon* is added to the sap by the leaves. By this is not meant, however, that it is without that substance until it reaches these organs, but merely that an extra quantity of this element is hereby added to it. How, therefore, is this accomplished? We have already repeatedly stated, that carbon always exists in the atmosphere in the form of *carbonic acid gas*. Now, it has been ascertained that the leaves, while exposed during the *day* to the sun's rays, have the power of absorbing this carbonic acid, and afterwards decomposing it, the *carbon* being retained, and the *oxygen* given out again in the form of gas. During the *night*, however, or in the shade, no such change takes place. Carbonic acid, indeed, may be absorbed, probably in the form of a solution in water, as it is well ascertained that leaves take up moisture during the night; but it does not appear to undergo any decomposition: part of it, in fact, is given out in an undecomposed state; and as oxygen is removed from the air, at the same time that this evolution of gas is going on, it is supposed that plants have the power during the *night*, of absorbing oxygen, which dissolves part of their *carbon*, and re-escapes in the form of *carbonic acid*. Thus, we see that, during the night, the exact reverse is taking place to what was effected while the leaves were exposed to the rays of the sun. In the latter case, carbonic acid being absorbed, the carbon is retained, and the oxygen evolved; whereas in the former oxygen is absorbed, and carbonic acid given out. What is the ultimate effect of these complicated and apparently inconsistent changes, it is hard to say.—The fact, however, remains unalterable; and from it we may draw at least two very valuable conclusions: *First*, From what we have said with reference to the formation of *carbonic acid gas* during the burning of vegetable matter, and since it is well known to all that this gas is likewise contained in great abundance in the breath of all animals, it is clear that, unless there were some process in constant operation of removing it from the air, our atmosphere would soon become so contaminated with this noxious gas (choke-damp,) that it would be incapable of supporting life. Now, it has been conjectured that this constant absorption of carbonic acid by plants during the day, and the evolution of oxygen (the constituent of air most essential to life,) has the effect of preserving the healthy condition of the atmosphere. *Secondly*—But, on the other hand, it is equally important to remember that the reverse takes place during night; plants at that period *vitiating* the air; which accounts for it not being healthy to sleep in apartments where a great number of plants are growing. But to return from this digression. From the facts above stated, we find that the leaves absorb carbonic acid and water; and, for the present, we shall rest content with this, and proceed at once to consider of what the food of plants really consists,—now that we are so far acquainted with that important function exercised by plants—namely, absorption—by means of which they receive their nourishment. And, in the first place, we may very briefly show the analogy which exists in this particular between plants and animals; by doing which we shall be enabled to render the sequel much more intelligible. It is well known to all who are conversant with the functions of living animals, that after the food is received into the stomach it undergoes certain changes; one of the most important of which is its being rendered *soluble*, and afterwards is *absorbed* by a special set of vessels called *lacteals*, and is then carried to the lungs to be converted into blood. Now, the analogy is perfect, if we take into consideration that plants have no stomach, and, therefore all the preparation which takes place in the stomach of animals, has to be performed in the *soil*. Hence Greisenthwaite, a most ingenious writer on this subject, says, "The soil may be regarded as the stomach, the common receptacle of the food of plants, in which manure is coverted into substances that are soluble; and afterwards those soluble substances are absorbed by the capillary tendrils of the roots, in a manner exactly similar to that already observed of the *lacteals* of animals." A moment's reflection will at once, therefore, clear up all difficulties; for we perceive that the *spongioles* of the root act exactly as the *lacteals* of animals,—namely, they absorb the soluble matters prepared in the stomach (soil,) and carry it to the leaves to be converted into *perfect sap*, which process likewise corresponds exactly to the conversion of the matter absorbed by the lacteals into perfect blood.

Description of a Grass Seed-Sowing Machine.

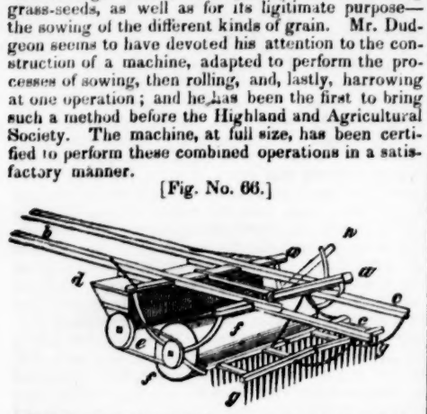
By Mr. Dudgeon, Broomhouse, East-Lothian.

[*From the Edinburgh Quarterly Journal of Agriculture.*]

This machine, of which a model was lodged by Mr. Dudgeon about twelve months ago in the Society's Museum, is an amplification of the common broad-

cast sowing-machine, so frequently used for sowing grass-seeds, as well as for its legitimate purpose—the sowing of the different kinds of grain. Mr. Dudgeon seems to have devoted his attention to the construction of a machine, adapted to perform the processes of sowing, then rolling, and, lastly, harrowing at one operation; and he has been the first to bring such a method before the Highland and Agricultural Society. The machine, at full size, has been certified to perform these combined operations in a satisfactory manner.

[Fig. No. 66.]



In the annexed cut, this compound machine is exhibited in perspective, wherein the combination of the harrow and the roller are detailed along with the sowing apparatus, and may be shortly described as follows;—*a a* are the fore and hind bars of the top frame set at the distance of 2 feet apart, their length being about 7 feet 4 inches. To these are bolted down the horse-shafts *b* of the ordinary length, but having in addition, the extension bars *c c* bolted to the end of the shafts. The seed-chest *d*, 6½ feet in length, is appended to the lower side of the horse-shafts, immediately in front of the fore-bar, and may be fitted up in all respects similar to the common broadcast seed-chest, the spindle which carries the small discharging toothed wheels being put in motion by a belt or a chain passing over a pulley *e*, 12 inches in diameter, on the projecting end of the spindle; the belt or chain receiving its motion from another pulley of 9 inches diameter, placed on the axle of the roller, now to be described. The roller *f f* which is also 6½ feet in length, is about 18 inches in diameter, though this is not imperative, nor is the material of which it is made of any essential importance. The roller is supported by its journals in two simicircular bars of malleable iron, or they may be cast of iron, bolted to the extremities of the fore and hind bars *a a*. From the simicircular bars proceed also two stays for the further support of the seed-chest. The harrow *g g* is suspended immediately behind the roller; it consists of two frames, each 3½ feet in length, and 1 foot in width. These are jointed end to end, forming a harrow 7 feet in length, having only two rows of tines. The tines are set at 2½ inches distant, and, as the tines of the one row alternate with those of the other, they will make a rut at every 1¼ inch. The direct suspension of the harrow is effected by means of chains from the movable bar *h*; this being jointed at the one end is capable of being raised from the horizontal position to the position *h*, or to any intermediate point, and retained there by a pin passed through a quadrant over which the bar moves; by this means the harrow is regulated as to depth, while by means of a link from the simicircular bars, and by the chain from the extremity of the extension bars *c c*, it is duly stayed in a proper position, while it has sufficient freedom of swing to insure its useful effect. The joint at the middle of the harrow allows it to accommodate itself to the rounding of the ridges when required. The lever seen in the middle of the top frame is, through its connection with another lever on the back of the seed-chest, used for opening and shutting the orifices, and for regulating the discharge of the seed, by moving a long slide plate in the usual manner.

It may be remarked of this machine, that the particular succession here shown, that is to say *sowing*, *rolling*, *harrowing*, is not considered essential to its success; and that any other, as *rolling*, *sowing*, *harrowing*, may, under different circumstances of soil and management, be found equally successful.

Prevention of Mildew or Rust.

The following account of a successful experiment, in destroying mildew in wheat, is from the Rev. Mr. Cartwright, and is copied from the Edinburgh Quarterly, and from a paper on the diseases of cultivated plants, by G. W. Johnson, Esq. Although the application demands some labor, that labor is not to be put in competition with the value of the wheat crop. We have confidence in the authority and in the efficacy of the antidote; and recommend the prescription to our farmers for trial.

"I and a neighbor of mine have applied it as a remedy for the mildew in wheat, with the most unequivocal success. I first made the discovery about two years ago. My experiments at that time were upon a very limited scale. They have this year only extended over an acre and a half, but under circumstances that leave not a shadow of a doubt of salt being an absolute specific for mildew, in the most aggravated stages of the disorder. Of this I will state to you a convincing proof. In the year 1818, I found a few ears of wheat, which I conceived to be a new and improved variety. From these ears I raised as much wheat as last year planted a piece of land 4 feet wide, and 100 yards in length. The produce I had promised Mr. Coke, and to augment that produce, I had the ground, previously to planting, highly manured; and as soon as the wheat came up, I gave it a good dressing with soot, and this dressing was repeated once or twice. In consequence of this superabundant dressing, the wheat, as might indeed have been expected, was as rank as the wheat you may observe growing accidentally upon a dunghill, which never fails to rot upon the ground, without bringing a single grain to maturity.

"The mildew made its appearance on this particular part of my field, while the straw was quite green, and the grain in a milky state. Notwithstanding the danger that might be apprehended to the wheat itself, from its being thus succulent, I ventured to give it a dressing with salt and water. As a heavy shower of rain fell a few hours afterwards, the dressing was repeated the next morning.

"The proportion of salt to the water, one pound in a gallon, laid on with a plasterer's brush, the operator bearing a pail of the mixture in one hand, and the brush in the other, making his casts as when sowing corn; or else with a common watering-pot, which, being swung with great force, throws the water very rapidly. Two men will get over about four acres a-day, the one to spread, the other to supply the mixture.

"The result was, that the mildew was completely subdued, and the wheat went forward to maturity, and although the sample was not so bold as it might have been, it was sound and marketable. In other parts of the field, where the mildew shewed itself, not under the aggravated circumstances described above, but as it usually appears, the wheat was not in the least injured by it, after the salt and water were applied; it was indeed as fine a sample as could be grown. Both mine and my neighbor's wheat were examined by many practical farmers, who are so decidedly convinced of the efficacy of my remedy, that they intend never to be without a reserve of salt, ready to meet the enemy the moment he appears.

"The effect of the salt upon the mildew, to those who do not consider the manner of its operation, is truly astonishing; I believe it to be instant death to the fungus; this, however, is certain, in less than forty-eight hours the straw nearly recovers its original colour and brightness. The certainty and celerity of its operation, I account for thus: The mildew, it is now well ascertained, is a parasitical plant, of the fungus tribe, the principal constituent of which is water; when salt, therefore, is applied to them, the aqueous particles are immediately absorbed, and their vitality destroyed. The action of salt upon mushrooms, as in making mushroom catsup, confirms this theory."

Mr. Johnson adds—"I can afford decided testimony to the efficacy of the cure recommended by Mr. Cartwright; but I would add these precautions. The safest quantity of salt per gallon is eight ounces, and then the application may be rendered more effectual by frequent repetition, without any danger of injury to the plants. If the application is not made during a clouded day, it is best to defer it until the evening.

"Some have recommended a rope, held at its extremities by two men, to be drawn up and down each ridge of the infected crop, to remove the fungus; and there is no doubt that this treatment is partially effectual, for the parasite is removed wherever it comes in contact with the rope, but the points of contact necessarily are limited."

Nothing is Annihilated.

The researches of chemists have shown, that what the vulgar call corruption, destruction, &c. is nothing but a change of arrangement of the same ingredient elements, the disposition of the same materials into other forms, without the loss or destruction of a single atom; and thus any doubts of the permanence of natural laws are discountenanced, and the whole weight of *appearances* thrown into the opposite scale. One of the most obvious cases of appareat destruction is, when any thing is ground to dust and scattered to the winds. But it is one thing to grind a fabric to powder, and another to annihilate its materials: scattered as they may be, they must fall somewhere, and continue, if only ingredients of the soil, to perform their humble though useful part in the economy of nature. The destruction produced by fire is more striking; in many cases, as in the burning of a piece of charcoal, or a taper, there is no smoke, nothing visibly dissipated and carried away; the burning body wastes and disappears, while nothing *seems* to be produced but warmth and light, which we are not in the habit of considering as substances; and when all has disappeared, except perhaps some trifling ashes, we naturally enough suppose it is gone, lost, destroyed. But when the question is examined more exactly, we detect, in the stream of invisible air which ascends from the glowing coal, or flaming wax, the *whole* ponderable matter, only united in a new combination with the air, and dissolved in it. Yet, so far from being thereby destroyed, it is only become again what it was before it existed in the form of charcoal or wax, an active agent in the business of the world, and a main support of vegetable and animal life, and is still susceptible of running again and again the same round, as circumstances may determine; so that, for aught we see to the contrary, the same identical atom may be concealed for thousands of centuries in a lime stone rock; may at length be quarried, set free in the lime-kiln, mix with the air, be absorbed by it from plants, and, in succession, become a part of the frame of myiads of living beings, till some concurrence of events consigns it once more to a long repose, which, however, no way unfits it from again resuming its former activity.—*Herschel on the Study of Natural Philosophy.*

Young Men's Department.

"What is Education?"

We commend to every young reader, who aspires to the good things of life—as wealth, reputation and happiness—the following extract, which we make from an article on education, in the North American Review. It is worthy a careful perusal,—of a re-perusal—and of being treasured up in the memory. It exhibits the true foundation, if not the only one, upon which any young man can expect to rear a superstructure of substantial usefulness.

"What is education, such education as deserves the name? Not the getting by rote set forms of words which may be altogether barren of profitable fruit; no, nor barely storing the memory with the information of facts, however extensive and useful.—An abundant stock of these, judiciously laid in, may doubtless prove of wonderful advantage in the after occasions of life. But education truly and faithfully accomplished, is the full and well-proportioned development of all a man's physical, intellectual, and moral capacities; such as sends him into the conflict of his earthly probation, a sound mind in a sound body, to fulfil the dictates of a sound heart. Training, aptly administered to this end, fosters and confirms all virtuous dispositions, checks and finally eradicates all unworthy propensities. The scholar learns to scorn ignoble objects of pursuit, and wisely bends his undivided energies, with an ingenuous ardor, to effect the liberal purposes of a comprehensive benevolence. He places his supreme happiness in the solid satisfaction of duty well performed. He knows how to choose the right; and, having made his election, his understanding and all his corporeal faculties, operate in their several functions in due subordination to realize his will. He is nerved for the fight, he can breast himself manfully against every assault, he will triumph victoriously over all opposition, for he feels himself strengthened to every good word and work, both in the inner and outer man. 'I call, therefore, a complete and generous education,' says Milton, 'that which fits a man to perform justly, skilfully, and magnanimously, all the offices both private and public, of peace and war.'

"Under such instruction he will grow up to understand and realize his position in the universe, and his relations to his fellow creatures, and what it is incumbent on him to be and to do, by virtue of their mutual dependencies. Society has done much for him. It has raised him above the level of the brutes, and he owes to society a return,—a large return,—vastly more than he can ever pay, though he were a Bacon or a Newton, a Lafayette or a Washington; but his inability to repay all does not release and cancel the debt of gratitude.

"There is an indefeasible obligation upon every man to do something for the world he lives in. He should ever bear it on his conscience to discharge this duty. With the blessing of God, he should say to himself, 'The world shall be somewhat better that I have lived in it.' He who does not say this, in sincerity and truth, is no nobler than the beasts that perish. Morally he is beneath them; for they act up to their light, and feel no responsibility for which they are not ready to give an account, while he lives in the daily sense that his part in the world's work is unperformed. While he yields no fruit, he only cumbers God's vineyard; and, when he is cut down, but few will mourn over him.

"Far otherwise is it with him in whose daily meditations philanthropy is ever present as a governing principle. Who are the truly useful? To whom is the world indebted for those magnificent benefactions, which have blessed millions and generations,—improvements in government, advancement in religion, and in civilization? To whom are mankind indebted for the noiseless but resistless progress of good principles, whereby greater changes are effected in the

condition of the whole human family, than have grown out of the efforts of the mightiest conquerors, or than have followed the most renowned revolutions of empire! To those whose moral education has fixed in their hearts permanent and actuating principles of conduct. There have been men of erudition, whose memories were libraries for the singular benefit of their associates, but whose learning died with them. There have been men of forecast and sagacity unsurpassed,—our own times have witnessed some of them,—who, having no rule of action except their own immediate advantage, have been governed by circumstances, instead of subjecting circumstances to their own control. But those who are widely and lastingly useful, are the men upon the stability of whose moral character reliance can be safely reposed. With such the sense of duty is habitual; and, therefore, even if they cannot boast of uncommon talents, extensive acquirements, or a broad field of action, still, as all their acts have the same tendency, their influence is always in the same direction: and, operating silently and unseen, is the cause of meliorations in the moral tone of society, perceived after a few years by all, but understood while they are going on only by a few reflecting observers. With such, the performance of duty is pleasant, because all their desires are trained to accordance with the moral sense; and they, therefore, do good naturally, and as of course, with less effort and internal struggle than the bad experience when they do evil.

"It has sometimes been strangely questioned, whether a popular sound morality might not be the natural offspring of ignorance and delusion, and whether a refined education did not weaken in the soul the sanctions of religion, and relax those bonds which hold together the compact of society. But were it not blasphemy against the God of truth to doubt, that the illumination of the intellect with the radiance of wisdom infuses into the heart the love of virtue? Goodness is the imprint which the sense of truth stamps indelibly upon the character. All noble thoughts are types of noble action. From the contemplation, to the imitation of ideal excellence, the transition is natural and easy. The divine light of moral science sheds a clear distinctness over our true interests, and shows the path of duty marked in a bold outline. Before its purifying beams, all evil thoughts and low desires vanish as the noonday splendor dissipates the mists of the valley. The well-educated man stands before the world the image of his Maker, having attained as nearly as may be to the perfection of his moral nature. He exhibits not merely a speculative but an active virtue, and all beholders are constrained to confess that wisdom is justified of her children.

"If indeed the security of the public morality reposed on the public ignorance, if delusion were the palladium of our well-being, miserable would be the condition of humanity; for ignorance is of the earth, earthy, and must soon pass away. But the progress and prosperity of our race rest on no temporary and precarious reliance. When delusion has died of old age, truth will still flourish in eternal vigor. She renews her youth like the eagle. When to mortal eyes she appears vanishing for ever, behold, like the young sun rejoicing in his course, she rises again. She is not of created things, and is therefore exempt from their destiny. God's well-beloved daughter knows neither age nor decay. Before the work of creation began, she was with the Father of all things; and, when Time shall have ceased to be, she will stand before his throne, and still bask in the living light of the ineffable presence.

"It is not merely poetry, but the ultimate result of all moral argument, that, 'true self-love, and social, are the same.' 'This is the foundation of all human wisdom,' says Le Père Buffier, 'the source from which all virtues, purely natural, flow, the general principle of all morals, and of all human society, that while I live with other men, who equally with myself desire to be happy, I must try to discover the means of increasing my own happiness, by augmenting that of others.' Cicero regarded it as the basis of ethics, 'ut eadem sit utilitas uniuscujusque et universorum.' A higher authority than Cicero has established a whole code of duty upon the maxim, 'Do ye therefore unto others as ye would that others should do unto you.'

"It is impossible therefore that the study even of temporary interests should derogate from the just influence of moral principles, at least while conducted on broad and comprehensive views; since there is no contrariety between them, but rather a strict conformity, the more evident as those interests are better understood.

"But it is not to be forgotten, that the cultivation of the intellect is but a part, and not the most important part of a good and perfect education. The pre-eminent worth of moral cultivation should be strongly impressed on every parent and teacher. With a little care, many salutary precepts may be instilled into the minds of youth, such as shall deserve to be treasured up among the guiding maxims of their lives, and meditated upon as the fundamental principles of practical wisdom. These, being firmly rooted in their memories, will help them to form solid and substantial characters, which in after life will stand the test of every trial. Correct habits must be acquired, the sovereignty of conscience over the whole man must be established, the power of self-reliance must be gained, and the sentiment of independence nourished. Imbued with virtuous principles, and having learned to prize above all price, and to preserve at every hazard, the testimony of an approving conscience, the youth goes into the world armed at all points. To gird him with this panoply should be the endeavor of his moral education.

"Almost the best defence, at least one of the strongest safeguards of morality, is the feeling of independence. If the world thinks that to be right which you think to be wrong, follow your own opinion, and preserve your self-respect. Consider that you would rather be honorable and despised, than be honored and despicable. If the world holds you in light esteem because it misunderstands your character, every mark of disrespect which it bestows upon you is a certificate of the beauty and excellence of those virtues in which it erroneously supposes you to be deficient. But if the world, while it knows your character, disesteems you, because the principles that regulate your conduct are above the received standard of morality, and it is incapable of appreciating them, retire within your own bosom and enjoy that serene consciousness of rectitude, which can sustain undisturbed the hoarse clamor of popular invective. He who has the fortitude and the constancy to do this, and to go on steadily in the path of duty visible to his eyes alone, experiences not merely that tranquil satisfaction which a sense of obligation fulfilled brings always with it, but a loftier, nobler, prouder pleasure, even the most exalted of which our nature is susceptible here on earth, that unalloyed felicity which is the perogative of integrity invincible amid allurement or peril. The stern and solemn joy which bore the martyrs triumphant and exulting through their trials, which supported them and gave them the victory over shame and anguish and death itself, is the due reward of original and peculiar virtue, of virtue manifested in spite of temptation,—in spite of what is still harder to be resisted, ridicule, opprobrium, and scorn.

"He who is educated as all the youth of a Republic should be, his virtuous dispositions corroborated into fixed habits, his knowledge of his own powers and capacities perfected into a modest but confident self-reliance, his heart steeled with the inflexible determination to guard and preserve unviolated the sanctity of his own self-approval, while an enlightened conscience with a distinct and unequivocal bidding calls him onward and upward in the path of a purer morality, though the blandishments of fashionable example draw him backward and downward with the witchery of sympathy, will never yield to the seduction, nor be disobedient to the dictates of that monitor whose precepts are not set at nought without punishment. He will not follow the multitude to do evil against light and conviction. The mean and cowardly abandonment of principle for precedent, the despicable dereliction of that course, straight though solitary, in which the very instinct of a noble spirit urges him on, never suggests itself to his contemplation as within the range of possible alternatives. He will not sacrifice that pure delight which neither the smiles of the world can give, nor their frowns take away. He will not surrender himself an unwilling and a miserable slave to the tyranny of custom, a servitude which becomes every day more and more intolerable, which exacts compliances still more and more degrading, which never loosens its hold till it has reduced the spirit, created to be free, to a grovelling dependence on the decisions and caprices of others.

"With youth so educated, we should have none of that dissipation, without relish, endured, under a secret disgust, for fashion's sake; none of that servility of manners, the corruption engendered in the dotage of feudalism, preposterously imported into the wholesome simplicity of a vigorous republic; no prevarication in business, no equivocation in professions, no cant in criticism, no shuffling in politics, no temporizing in morals, no hypocrisy in religion. We should live in an honest and straight-forward world. Far distant though the dawning of this millennium may be, it is none the less desirable to hasten it onward; and though it were taken for certain, that neither we nor our children should ever enjoy the full fruition of so blessed a state, we should none the less strive for the nearest approach that we can attain to it."

"Wealth is not only fleeting; it is neither the sole, nor the best foundation on which to rest our hopes of happiness, even while it lasts. Respectability of character is of far higher value, and much less likely to be lost through the caprices of fortune. It would be a waste of words to show, that an unspotted moral life must confer respectability, and that respect derived from whatever qualities, without this, must be short-lived and of little worth. Equally self-evident is it, that those who live in the constant practice of moral duty, though wealth and respect should both desert them, have internal resources for consolation of which they cannot be deprived. He who possesses a conscience void of offence is passing rich, whether he has much or little of this world's goods. He who is not afraid to be alone with is Maker, is independent of the smiles or frowns of the world. The sunshine of prosperity, the tempest of adversity, neither seduce nor terrify his steadfast soul. The basis on which his happiness is fixed, the immovable, imperturbable basis of a good conscience, he owes to a good moral education."

Chemical Catechism—Chapter VI.

[*From Parkes's Chemical Catechism.*]

OF ALKALIES.

What is the nature of an alkali?*

The alkalies have an acrid and peculiar taste; they change the blue juices of vegetables to a green, and the yellow to a brown; and have the property of rendering oils miscible with water. They are incombustible, but may be rendered volatile by great heat. They are soluble in water; form various salts by combination with acids†; and act as powerful caustics when applied to the flesh of animals.‡

How many alkalies are there?

There are three alkalies; two of which have been called *fixed* alkalies, the other the *volatile* alkali.

Which are the fixed alkalies?

The fixed alkalies are potash§ and soda.‖

Why have they been called fixed *alkalies?*

Because they will endure great heat without being volatilized; and yet in a very high temperature, they are dissipated in vapor.

What substances enter into the composition of these alkalies?

Till lately the fixed alkalies were considered to be *simple* substances, no one having been able to decompose them; but they are now found to be *compound* bodies.

Have we any historical account of the discovery of these substances?

Potash was known to the ancient Gauls and Germans; and soda was familiar to the Greeks and Hebrews. This latter substance was known to these ancients by the name of *nitrum*.¶

What is the origin of potash?

Potash is chiefly procured by lixiviation from the ashes of burnt wood, and other vegetable substances; but as it exists in minerals and earths, there is reason to believe that plants receive it from the earth, during vegetation: hence it may be proper to discard the word *vegetable* entirely, when speaking of this substance.

What is the origin of soda?

Soda is generally procured from the ashes of *marine* plants;** but its great depository is the ocean, soda being the base of sea-salt, or muriate of soda.

* To a person who has not had an opportunity of examining an alkali, no written description that can be given will convey any correct idea of the taste or properties of this class of bodies: let the pupil, therefore, procure a specimen of each kind, before he enters upon this chapter. The juice of the gooseberry and the lemon, and many other vegetable substances, will remind him of the general properties of the acids: but having met with nothing analogous to the alkalies, it will be necessary for him to *taste* and examine one of these bodies in order to acquire any thing like a just idea of their nature. Let him form potash or soda into a neutral salt, by saturating it with one of the acids, and he will perceive still more of the nature of these bodies.

† Potash becomes comparatively mild by its union with carbonic acid; and the most caustic soda, if united to corrosive muriatic acid, forms murinte of soda, our mild tea-table salt.

‡ If a piece of animal flesh be put into a strong solution of potash or soda, it will immediately be acted upon by the alkali, and soon be entirely dissolved.

The alkalies have a great affinity for water: it is therefore probable that their causticity is owing to this circumstance, water being so abundant in animal bodies. If the alkalies be dissolved in a large portion of water, their caustic qualities are diminished, though not in any measure destroyed thereby.

§ This alkali was formerly procured by burning vegetables in large iron pots; hence it acquired the name of *pot*-ash.

‖ Soda acquired its name from the plant *salsola soda*, which grows on the Spanish coast, and is burnt for its preparation.

¶ This substance is found native in Egypt, and is there called *natron*; a name not much unlike that which it bore among the Jews and Greeks.

** The *salsola soda*, which grows among the cliffs on the sea-coast, is said to be endowed with the property of decomposing sea-salt, and that by some process of vegetation it separates the muriatic acid and absorbs the soda. Hence it acquired the name of *saltwort*. This plant is collected by the Spaniards with great care, and burnt for the manufacture of Barilla, which is a considerable article of commerce. Thus Nature has providentially furnished the inhabitant of the otherwise barren coast with a source of employment, and has enabled him to supply the interior with an article of indispensable necessity, for ages before the science of chemistry could afford him other means of decomposing muriate of soda.

"The *saltwort's* starry stalks are thickly sown,
Like humble worth, unheeded and unknown."

Charlotte Smith.

How is it that marine plants give out soda, while those which grow in the interior of the country afford potash?

This has been accounted for by supposing that these marine vegetables have the power, during vegetation, of decomposing sea-salt, and retaining the soda in their constitution.

Is soda found in any other state?

Soda combined with carbonic acid is found in great plenty in the natron beds of Egypt,* and in the East Indies: it occurs also in various other parts of the world, though never in a state of purity, and enters into the composition of the *sodalite* and of several other minerals.†

What are the distinguishing properties of these two alkalies?

The fixed alkalies are very similar in their general properties; but are easily distinguished by the variety of salts which they form with the acids; and by potash being more deliquescent than soda.

Is there any chemical test by which you can distinguish these two alkalies?

There are many; but a solution of the ore of platina in nitro-muriatic acid will answer this purpose most completely.

What are the chief uses of these alkalies?

The fixed alkalies have various uses in surgery and medicine: they are the bases of several salts; are employed much in the arts:‡ and are of great importance to the analytical chemist.

How are the fixed alkalies employed in the arts?

The fixed alkalies are used in large quantities by the glass-maker,§ the dyer, the soap-maker, the colour-maker, and by various other manufacturers.

In a former chapter, we noticed the use of fixed alkali in making glass:—What is the use of it to the dyer?

The alkalies are known to have the property of altering the hue of most colours; they are therefore employed with this view by the persons who are engaged in this trade.

Why are the alkalies employed in making soap?

An alkali is an essential ingredient in soap, as it is the only article capable of converting tallow or oil into a saponaceous substance, and enabling it to combine with water.*

Why are fixed alkalies employed in making colours?

Many colours are now manufactured in this country which cannot be made without an alkali: thus, animal matters are always incinerated with an alkali to form Prussian blue; a fixed alkali is also employed as a flux in the formation of the potter's blue from cobalt; and what are called French and mineral greens are made by precipitating copper from its solutions by means of these alkalies.

What are the other uses of these alkalies?

They are employed in making alum; in bleaching linen; in scouring wool; and in many other processes too various to be enumerated.

From whence is this country supplied with these articles?

The greatest part of the potash used in this country comes from America and Russia; but the *kelp* of our own coasts, and the *barilla* of Spain and of the islands of Teneriffe and Sicily, furnish us with most f our mineral alkalies.

Are these alkalies sold in a state of purity?

No: both potash and soda always contain carbonic acid* and water; and are often contaminated with earths, sulphur, and other impurities.

Have alkalies any peculiar affinity for sulphur?

Both potash and soda, as well as ammonia, have a strong affinity for sulphur; they combine by trituration or heat, and form *sulphuret* of alkali, formerly called *hepar sulphuris*, or "liver of sulphur."

What is the nature of sulphuret of alkali?

Its colour is similar to that of the liver of animals; its taste is acrid and bitter; and it has the property of decomposing water.

How are the alkalies of commerce purified for the use of the chemist or manufacturer?

Potash or soda is generally mixed with a portion of quick-lime to divest it of carbonic acid, and then lixiviated in proper vessels to obtain a solution of the caustic alkali, free from other impurities. When it is required *perfectly* pure for nice purposes, the alkali is dissolved in alcohol, and purified by a peculiar process.

Are the fixed alkalies ever used in a state of combination with carbonic acid?

Carbonic acid gives potash and soda the property of crystallizing readily; it also renders them mild, and fit for purposes in which caustic alkali would be improper; hence carbonate of potash is employed in medicine, and carbonate of soda for washing and other domestic uses.

What is the chemical name of the volatile *alkali?*

It is called ammonia.

What are the properties of ammonia?

Ammonia when uncombined with water, or any other substance, exists in the state of gas, and is then so extremely volatile as to exhale at all known temperatures. Its volatility is diminished in some degree by combination with water, still more so by combining with carbonic acid, and most when combined with the mineral acids. In the gaseous state it has a remarkably pungent smell, it instantly extinguishes flame, and would be fatal to any animals that were obliged to breathe it. It is lighter than atmospheric air in the proportion of 6 to 10.

As this alkali is a gaseous substance, how can it be applied in the arts?

Ammonia has an affinity for water, with which it readily combines, and forms *liquid* ammonia; in which state it is generally used.

What is the composition of ammonia?

Ammonia is a compound of hydrogen and nitrogen, in the proportion of about one part of the former, and four parts of the latter, when calculated by weight, or of one measure of nitrogen and three of hydrogen if calculated by volume.

Is this alkali capable of being decomposed?

Yes; ammonia may be decomposed by the electric spark. Oxygen gas will also decompose it by the assistance of heat, and then nitrous acid and water will be the results. If passed over red-hot charcoal, it will combine with part of the charcoal, and form *prussic acid.*

What is the effect of galvanism on ammonia?

A very different result may be obtained if ammonia be decomposed in contact with mercury, by means of galvanism; for in this case a metallic substance of a very uncommon nature may be separated from this alkali.

How is ammonia procured?

All animal and vegetable substances, when in a state of putrefaction, will furnish ammonia: this alkali is, however, generally procured in England by a dry distillation of bones, horns, and other animal substances.

What are the uses of ammonia?

In a liquid state ammonia has various uses in our manufactories, and in medicine; it is a valuable reagent to the chemist; and when combined with carbonic acid it takes a concrete form and beautiful white colour, being then the article known in commerce by the name of *volatile salts.*

Are there any other uses to which ammonia is applied?

Ammonia is serviceable in dyeing, and in staining ivory; but its principal use is in making the muriate of ammonia, of which it is the basis.

How is ammonia formed into muriate of ammonia?

Muriate of ammonia is formed by combining ammonia with muriatic acid. It is known in commerce by the name of *sal-ammoniac.*

Muriate of ammonia being formed by two gaseous substances, how does it acquire solidity?

It may appear surprising that the union of two gases should produce a hard ponderous body; but this may be attributed to their loss of caloric. The bases of these gases having a greater affinity for each other than they have for caloric, they combine intimately whenever they come in contact; and the compound having less occasion for caloric than the separate ingredients, the caloric is given out, and a solid is produced.

What are the uses of sal-ammoniac?

Sal-ammoniac is employed in many of our manufactories, particularly by dyers, to give a brightness to certain colours; also by braziers, tin plate workers, and others; and in medicine.

From whence was sal-ammoniac procured before it was made in this country?

Sal-ammoniac was formerly brought from Egypt sufficient for the supply of all Europe; but it is now made in various parts of Great-Britain, particularly in Scotland, where it is formed by a peculiar process from soot; and also from a variety of refuse animal matter.

Is ammonia capable of entering into any other combinations?

Yes: ammonia is capable of forming salts with most if not all of the acids.

Can you recapitulate the origin of the different alkalies?

The volatile alkali is procured from bones and other animal matters; potash or vegetable alkali from the ashes of weeds and burnt wood: and soda or mineral alkali from the ashes of some marine plants, also from sea-salt or muriate of soda.

What is the natural inference from a consideration of the nature and production of the alkalies?

The reflection which naturally arises from a consideration of this subject is, that the original organization of matter, whereby the effete recrementitious parts of animals and vegetables are made capable of producing useful and powerful substances, evinces, that infinite Power and Wisdom, united with consummate Beneficence, can effect the most *important* changes, by the most *unlikely* agents; and can convert to valuable purposes, substances which to us appear totally useless and inert.

Most of the peasantry in the Shetland Isles, and in the Highlands of Scotland, are supported by collecting sea-weeds, and burning them into KELP, an article which produces great revenues to the lairds of those districts. Many of the wretched inhabitants of those dreary regions have nothing to depend upon for subsistence, but a miserable pittance, which they acquire in this employment.

* The natron lakes of Egypt annually produce a large quantity of mineral alkali. In summer the water of these lakes is evaporated by the sun, which leaves a bed of natron generally two feet thick; and this is broken up by wedges, and packed for the European markets.

† Soda is one of the substances found in the bile of animals. Whenever this alkali occurs native, it is always in a *mild* state; and as it cannot combine with oils to form soap, unless it be *caustic*, this causticity is given it for these manufactories by artificial means. It is worthy of remark, that Nature has furnished the bile with soda in a state of *causticity*, which gives it the property of combining with and saponifying the fat or oily substances taken into the stomach, and rendering them soluble in the other animal fluids. What account can be given of this deviation from the usual course of nature, but the important purpose which it serves in the animal economy?

‡ The greatest consumption of the fixed alkalies in this country is in the manufacture of soap. They are also largely employed in bleaching, and in the manufacture of glass. Soda and potash are also both used in washing, and for other domestic purposes; as they powerfully unite with all greasy substances, which they render soluble in water.

§ It is curious to observe, that the alkalies combine with *transparent* olive oil, and produce *opake* soap; and that they unite with *opake* sand to form *transparent* glass. How various are the properties that have been impressed upon those primary materials of the universe, that were intrusted to man for the promotion of his convenience and comfort!

‖ To make soap, it is necessary to employ a fixed alkali in a *caustic* state. In this country, the business is usually conducted in the following manner: Spanish barilla or Scotch kelp is broken in pieces, or coarsely ground by a horse mill: and, when mixed with a sufficient quantity of quick-lime to absorb the carbonic acid, the whole is thrown into large wooden or iron vats, and covered with water. In great works, these vats are generally of cast iron, and sufficiently capacious to hold three or four tons of alkaline ashes. At a proper time, the water, impregnated with the caustic alkali, is let off into iron receivers below, and the v ts are covered again with water, which, after standing a sufficient time, is let off as before. This liquor is called soap-boilers' l.e. When a sufficient quantity of this is prepared, Russian or English tallow is put into a large iron boiler, and melted with a portion of the abovementioned alkaline lie. At first, the tallow appears liquid like oil, but during its boiling it acquires by degrees consistence as it saponifies. When the alkali is uniformly combined with the tallow, the weak liquor is pumped from beneath the soap, and fresh lies are added in their stead. These are boiled as before, till the soap exhibits certain appearances well known to the manufacturer; it is then cooled down, and poured into deep wooden frames, 15 inches wide and 45 inches long; where it remains till it has acquired a sufficient degree of solidity to be cut up for sale. It is the *alkali* which gives soap its detergent quality, and which renders it soluble in water. The tallow serves to moderate the sharpness of the alkali, and to prevent its injuring the hands of those who use it.

In making yellow soap, resin is used in the proportion of about one part to three or four parts of tallow. The resin makes the soap more detersive, and enables the manufacturer to sell it cheaper. Common fish oil, when its price permits, is also used in yellow soap.

Potash is the alkali used for soft soap, the manufacture of which is a distinct and separate trade in this country. A solution of this alkali in a caustic state is boiled with fish oil; and when the oil is sufficiently saponified, and a complete union of the materials formed, the *whole* is poured into small casks for sale, the water having combined with the oil as well as the alkali.

* The potash and soda of commerce contain nearly one-fifth of their weight of carbonic acid, beside lime, silica, and other impurities.

PRICE CURRENT.

ARTICLES.		New-York. Nov. 21.	Boston. Nov. 14.	Philadelphia Nov. 19.	Baltimore. Nov. 18.
Beans, white,	per bush.	1 25.. 1 30	2 00.. 2 25	1 50.. 1 75	1 00.. 1 25
Beef,	cwt.	7 50.. 7 75	6 00.. 7 38	7 00.. 8 50	7 00.. 8 50
Bacon, western,	lb.	12.. 15	13.. 14	13.. 14	15.. 16
Butter, fresh,	lb.	22.. 25	18.. 27	17.. 20	31.. 33
Cheese,	lb.	6.. 9	6.. 9	8.. 9	9.. 10
Cotton, best,	lb.	10.. 16	9.. 13	9.. 12	9.. 12
Flour, best,	bbl.	8 25.. 8 75	8 37.. 9 00	7 50.. 8 12	7 25.. 7 50
GRAIN—Wheat,	bush.	1 78.. 1 85	.. ..	1 63.. 1 70	.. 2 00
Rye,	bush.	1 12.. 1 15	1 12.. 1 15	1 00.. 1 05	65.. 66
Oats,	bush.	46.. 53	41.. 46	.. ..	.. ..
Corn,	bush.	91.. 93	90.. 93	94.. 87	95.. 1 00
Ham, pork,	lb.	12.. 14	16.. 17	13.. 15	14.. 15
Pork, in hog,	cwt.	12 00.. 13 00	6 00.. 6 50	10.. 8 00	7 95.. 8 00
SEEDS—Red Clover,	bush	12 00.. 13 00	12 50.. 13 00	7 00.. 14 00	11 00.. ..
Timothy,	bush	2 25.. 2 85	2 63.. 2 75	2 75.. 3 25	2 25.. 2 50
WOOL—Saxony, fleece,	lb.	55.. 65	55.. 60	55.. 60	50.. 55
Merino,	lb.	50.. 55	50.. 55	45.. 50	45.. 50
1-4 and com.	lb.	40.. 45	35.. 40	48.. 52	35.. 40
Sheep,	head.	1 50.. 3 50	1 00.. 2 87	1 00.. 2 87	.. ..
Cows and Calves,		.. .. 45 00	25 00.. 37 00	18 00.. 40 00	30 00.. 40 00